# Dell™ PowerEdge™ *SC*1435 Systems

# Hardware Owner's Manual

# Notes, Notices, and Cautions

**NOTE:** A NOTE indicates important information that helps you make better use of your computer.

**NOTICE:** A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

**CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.**

# Contents

# 1

# About Your System

This section describes the physical, firmware, and software interface features that provide and ensure the essential functioning of your system. The physical connectors on your system's front and back panels provide convenient connectivity and system expansion capability. The system firmware, applications, and operating systems monitor the system and component status and alert you when a problem arises. System conditions can be reported by any of the following:

- Front or back panel indicators
- System messages
- Warning messages
- Diagnostics messages
- Alert messages

This section describes each type of message, lists the possible causes, and provides steps to resolve any problems indicated by a message. The system indicators and features are illustrated in this section.

## Other Information You May Need

⚠ **CAUTION: The *Product Information Guide* provides important safety and regulatory information. Warranty information may be included within this document or as a separate document.**

- The *Rack Installation Guide* or *Rack Installation Instructions* included with your rack solution describes how to install your system into a rack.
- The *Getting Started Guide* provides an overview of system features, setting up your system, and technical specifications.
- CDs included with your system provide documentation and tools for configuring and managing your system.
- Systems management software documentation describes the features, requirements, installation, and basic operation of the software.
- Operating system documentation describes how to install (if necessary), configure, and use the operating system software.
- Documentation for any components you purchased separately provides information to configure and install these options.

- Updates are sometimes included with the system to describe changes to the system, software, and/or documentation.

    *NOTE:* Always check for updates on **support.dell.com** and read the updates first because they often supersede information in other documents.

- Release notes or readme files may be included to provide last-minute updates to the system or documentation or advanced technical reference material intended for experienced users or technicians.

# Accessing System Features During Startup

Table 1-1 describes keystrokes that may be entered during startup to access system features. If your operating system begins to load before you enter the keystroke, allow the system to finish booting, and then restart your system and try again.

**Table 1-1.   Keystrokes for Accessing System Features**

| Keystroke | Description |
| --- | --- |
| <F2> | Enters the System Setup program. See "Using the System Setup Program" on page 23. |
| <F10> | Enters the System Diagnostics program. See "Running the System Diagnostics" on page 86. |
| <F11> | Enters the boot mode selections screen, allowing you to choose a boot device. |
| <F12> | Exits PXE boot. |
| <Ctrl+E> | Enters the Baseboard Management Controller (BMC) Setup Module, which allows access to the system event log (SEL). See the *BMC User's Guide* for more information on setup and use of BMC. |
| <Ctrl+C> | Enters the SAS Configuration Utility. See your optional SAS adapter *User's Guide* for more information. |
| <Ctrl+S> | Option is displayed only if you have PXE support enabled through the System Setup Program (see "Integrated Devices Screen" on page 28). This keystroke allows you to configure NIC settings for PXE boot. For more information, see the documentation for your integrated NIC. |

# Front-Panel Features and Indicators

Figure 1-1 shows the controls, indicators, and connectors located behind the optional rack bezel on the system's front panel.

**Figure 1-1.   Front-Panel Features and Indicators**
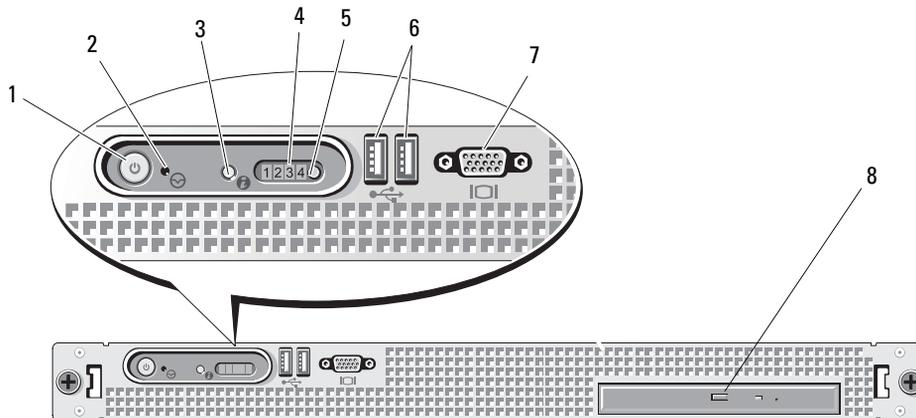


**Table 1-2.   Front-Panel Indicators, Buttons, and Connectors**

| Item | Indicator, Button, or Connector | Icon | Description |
|------|--------------------------------|------|-------------|
| 1 | Power-on indicator, power button | ⏻ | The power button controls the DC power supply output to the system.<br>**NOTE:** If you turn off the system using the power button and the system is running an ACPI-compliant operating system, the system performs a graceful shutdown before the power is turned off. If the system is not running an ACPI-compliant operating system, the power is turned off immediately after the power button is pressed. |
| 2 | NMI button | | Used to troubleshoot software and device driver errors when using certain operating systems. This button can be pressed using the end of a paper clip.<br>Use this button only if directed to do so by qualified support personnel or by the operating system's documentation. |
| 3 | System identification button | ⓘ | The identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pushed, the blue system status indicator on the front and back blinks until one of the buttons is pushed again. |

**Table 1-2. Front-Panel Indicators, Buttons, and Connectors *(continued)***

| Item | Indicator, Button, or Connector | Icon | Description |
|------|--------------------------------|------|-------------|
| 4 | Diagnostics indicator lights (4) | | The four diagnostic indicator lights on the system front panel display error codes during system startup. |
| 5 | System status indicator light | | Lights blue during normal system operation. |
| | | | Both the systems management software and the identification buttons located on the front and back of the system can cause the indicator to flash blue to identify a particular system. |
| | | | Lights amber when the system needs attention due to a problem. |
| 6 | USB connectors (2) | ⚡︎ | Connects USB 2.0-compliant devices to the system. |
| 7 | Video connector | ▯ | Connects a monitor to the system. |
| 8 | Optical drive (optional) | | One optional slimline optical drive |

**NOTE:** DVD devices are data only.

# Back-Panel Features and Indicators

Figure 1-2 shows the controls, indicators, and connectors located on the system's back panel.

**Figure 1-2.   Back-Panel Features and Indicators**



| 1 | serial connector | 2 | video connector | 3 | expansion slot |
|---|---|---|---|---|---|
| 4 | NIC1 connector | 5 | NIC2 connector | 6 | power connector |
| 7 | power cable retention bracket | 8 | system identification button | 9 | system status indicator |
| 10 | system status indicator LED cable connector | 11 | USB connector | 12 | USB connector |
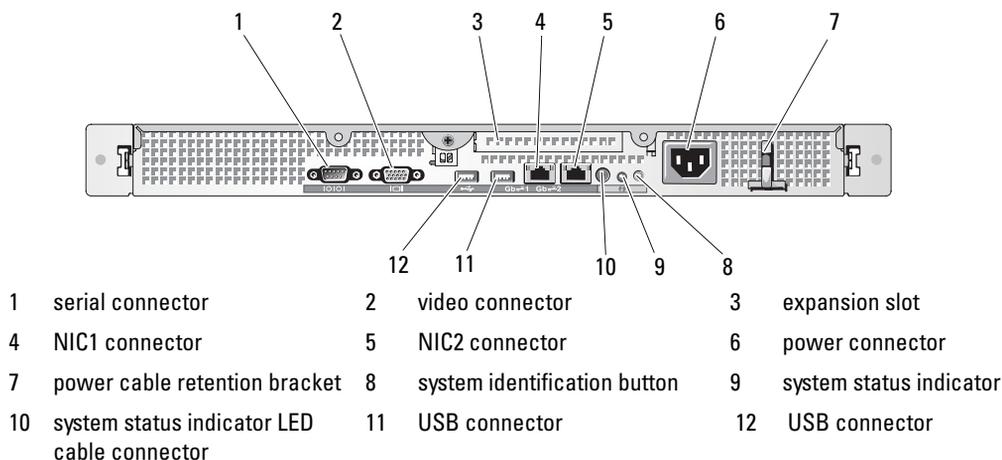
## Connecting External Devices

When connecting external devices to your system, follow these guidelines:

- Most devices must be connected to a specific connector and device drivers must be installed before the device operates properly. (Device drivers are normally included with your operating system software or with the device itself.) See the documentation that accompanied the device for specific installation and configuration instructions.

- Always attach external devices while your system is turned off. Next, turn on any external devices before turning on the system (unless the documentation for the device specifies otherwise).

For information about individual connectors, see "Jumpers and Connectors" on page 89. For information about enabling, disabling, and configuring I/O ports and connectors, see "Using the System Setup Program" on page 23.

# Power Indicator Codes

The power button on the front panel controls the power input to the system's power supply. The power indicator can provide information on power status (see Figure 1-1). Table 1-3 lists the power button indicator codes.

**Table 1-3.   Power Button Indicators**

| Indicator | Function |
| --- | --- |
| On | Indicates that power is supplied to the system and the system is operational. |
| Off | Indicates that no power is supplied to the system. |

# NIC Indicator Codes

Each NIC on the back panel has an indicator that provides information on network activity and link status. See Figure 1-3. Table 1-4 lists the NIC indicator codes.

**Figure 1-3.   NIC Indicators**



| 1 | link indicator | 2 | activity indicator |
| --- | --- | --- | --- |
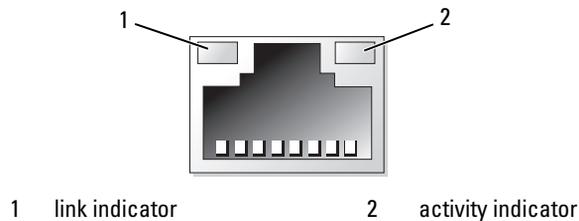
**Table 1-4.   NIC Indicator Codes**

| Indicator | Indicator Code |
| --- | --- |
| Link and activity indicators are off | The NIC is not connected to the network. |
| Link indicator is green | The NIC is connected to a valid link partner on the network. |
| Activity indicator is amber blinking | Network data is being sent or received. |

# Diagnostics Indicator Codes

The four diagnostic indicator lights on the system front panel display error codes during system startup. Table 1-5 lists the causes and possible corrective actions associated with these codes. A highlighted circle indicates the light is on; a non-highlighted circle indicates the light is off.

📝 **NOTE:** Once the system completes POST, all diagnostic lights will be OFF.

**Table 1-5.   Diagnostic Indicator Codes**

| Code | Causes | Corrective Action |
|---|---|---|
| ①②**③**④ | Possible processor failure. | See "Troubleshooting the Microprocessors" on page 82. |
| ①②**③④** | Memory failure. | See "Troubleshooting System Memory" on page 76. |
| ①**②**③④ | Possible expansion card failure. | See "Troubleshooting an Expansion Card" on page 80. |
| ①**②**③**④** | Possible video failure. | See "Getting Help" on page 95. |
| ①**②③**④ | Hard drive failure. | Ensure that the hard drive is properly connected. See "Troubleshooting a Hard Drive" on page 78. |
| ①**②③④** | Possible USB failure. | See ""Troubleshooting a USB Device" on page 71. |
| **①**②③④ | No memory modules detected. | See "Troubleshooting System Memory" on page 76. |
| **①**②③**④** | System board failure. | See "Getting Help" on page 95. |
| **①**②**③**④ | Memory configuration error. | See "Troubleshooting System Memory" on page 76. |
| **①**②**③④** | Possible system board resource and/or system board hardware failure. | See "Troubleshooting IRQ Assignment Conflicts" on page 68. If the problem persists, see "Getting Help" on page 95. |
| **①②**③④ | Possible system resource configuration error. | See "Troubleshooting IRQ Assignment Conflicts" on page 68. If the problem persists, see "Getting Help" on page 95. |
| **①②③**④ | Other failure. | Ensure that the optical drive and hard drives are properly connected. See "Troubleshooting an Optical Drive" on page 78 or "Troubleshooting a Hard Drive" on page 78.<br><br>If the problem persists, see "Getting Help" on page 95. |

**Table 1-5.  Diagnostic Indicator Codes *(continued)***

| Code | Causes | Corrective Action |
|------|--------|-------------------|
| ①②③④ | BIOS checksum failure detected; system is in recovery mode. | Ensure that all network connections are functioning properly. See ""Troubleshooting Your System" on page 67." |
| | | If the problem persists, see ""Getting Help" on page 95." |

# System Messages

System messages appear on the screen to notify you of a possible problem with the system. Table 1-6 lists the system messages that can occur and the probable cause and corrective action for each message.

*NOTE:* If you receive a system message that is not listed in Table 1-6, check the documentation for the application that is running when the message appears or the operating system's documentation for an explanation of the message and recommended action.

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

**Table 1-6.  System Messages**

| Message | Causes | Corrective Actions |
|---------|--------|--------------------|
| `Alert! Node Interleaving disabled! Memory configu-ration does not support Node Interleaving.` | The memory configuration does not support node interleaving.  The system will run but with reduced functionality. | Ensure that the memory modules are installed in a configuration that supports node interleaving. See "Memory Module Installation Guidelines" on page 46. If the problem persists, see "Troubleshooting System Memory" on page 76. |
| `Attempting to update Remote Configuration. Please wait...` | Remote Configuration request has been detected and is being processed. | Wait until the process is complete. |
| `BIOS Update Attempt Failed!` | Remote BIOS update attempt failed. | Retry the BIOS update. If problem persists, see "Getting Help" on page 95. |
| `Caution! NVRAM_CLR jumper is installed on system board.` | NVRAM_CLR jumper is installed. CMOS has been cleared. | Remove the NVRAM_CLR jumper. See Figure 6-1 for jumper location. |

**Table 1-6.   System Messages** *(continued)*

| Message | Causes | Corrective Actions |
|---|---|---|
| Diskette drive *n* seek failure | Incorrect configuration settings in the System Setup program. | Run the System Setup program to correct the settings. See "Using the System Setup Program" on page 23. |
| | Faulty or improperly installed diskette drive. | Replace the diskette. If the problem persists, see "Troubleshooting a USB Device" on page 71. |
| | Loose diskette drive interface cable. | Reconnect the diskette drive USB cable. See "Troubleshooting a USB Device" on page 71. |
| Diskette read failure | Faulty or improperly inserted diskette. | Replace the diskette. If the problem persists, see "Troubleshooting a USB Device" on page 71. |
| Diskette subsystem reset failed | Faulty or improperly installed diskette. | Replace the diskette. If the problem persists, see "Troubleshooting a USB Device" on page 71. |
| Drive not ready | Diskette missing from or improperly inserted in diskette drive. | Replace the diskette. If the problem persists, see "Troubleshooting a USB Device" on page 71. |
| Error: Incorrect memory configuration. CPU*n* System Halted! | Invalid memory configuration. | Ensure that the memory modules are installed in a valid configuration. See "Memory Module Installation Guidelines" on page 46. If the problem persists, see "Troubleshooting System Memory" on page 76. |
| Error: Memory failure detected. Memory size reduced. Replace the faulty DIMM as soon as possible. | Faulty or improperly seated memory module(s). | See "Troubleshooting System Memory" on page 76. |
| Remote configuration update attempt failed | System unable to process Remote Configuration request. | Retry Remote Configuration. |
| Fatal error caused a system reset: Please check the system event log for details. | Fatal system error. | Check the system event log for the specific cause, then see the appropriate section in "Troubleshooting Your System" on page 67. |
| Gate A20 failure | Faulty keyboard controller; faulty system board. | See "Getting Help" on page 95. |

**Table 1-6.  System Messages** *(continued)*

| Message | Causes | Corrective Actions |
|---------|--------|--------------------|
| General failure | The operating system is unable to carry out the command. | This message is usually followed by specific information. Note the information and take the appropriate action to resolve the problem. |
| Invalid NVRAM configuration, Resource Re-allocated | System detected and corrected a resource conflict. | No action is required. |
| Keyboard Controller failure | Faulty keyboard controller; faulty system board | See "Getting Help" on page 95. |
| Manufacturing mode detected | System is in manufacturing mode. | Reboot to take the system out of manufacturing mode. |
| Memory address line failure at *address*, read *value* expecting *value* <br><br> Memory double word logic failure at *address*, read *value* expecting *value* <br><br> Memory odd/even logic failure at *address,* read *value* expecting *value* <br><br> Memory write/read failure at *address*, read *value* expecting *value* | Faulty or improperly installed memory modules. | See "Troubleshooting System Memory" on page 76. |
| Memory tests terminated by keystroke. | POST memory test terminated by pressing the spacebar. | Information only. |
| No boot device available | Faulty or missing optical/diskette drive subsystem, hard drive, or hard-drive subsystem, or no boot disk in drive A. | Use a bootable diskette, CD, or hard drive. If the problem persists, see "Troubleshooting a USB Device" on page 71, "Troubleshooting an Optical Drive" on page 78, and "Troubleshooting a Hard Drive" on page 78. See "Using the System Setup Program" on page 23 for information about setting the order of boot devices. |

**Table 1-6. System Messages** *(continued)*

| Message | Causes | Corrective Actions |
|---|---|---|
| `No boot sector on hard drive` | Incorrect configuration settings in System Setup program, or no operating system on hard drive. | Check the hard-drive configuration settings in the System Setup program. See "Using the System Setup Program" on page 23. If necessary, install the operating system on your hard drive. See your operating system documentation. |
| `No timer tick interrupt` | Faulty system board. | See "Getting Help" on page 95. |
| `Not a boot diskette` | No operating system on diskette. | Use a bootable diskette. |
| `PCIe Degraded Link Width Error: Embedded Bus#`*nn*`/Dev#`*nn*`/Func`*n*<br><br>`Expected Link Width is` *n*<br><br>`Actual Link Width is` *n* | Faulty or improperly installed PCIe card in the specified slot. | Reseat the PCIe card in the specified slot number. See "Installing an Expansion Card" on page 44. If the problem persists, see "Getting Help" on page 95. |
| `PCIe Degraded Link Width Error: Slot` *n*<br><br>`Expected Link Width is` *n*<br><br>`Actual Link Width is` *n* | Faulty or improperly installed PCIe card in the specified slot. | Reseat the PCIe card in the specified slot number. See "Installing an Expansion Card" on page 44. If the problem persists, see "Getting Help" on page 95. |
| `PCIe Fatal Error caused a system reset: Slot` *n*<br><br>`or`<br><br>`Embedded Bus#`*nn*`/Dev#`*nn*`/Func`*n*<br><br>`Please check the system event log for details.` | Faulty or improperly installed PCIe card in the specified slot. | Reseat the PCIe card in the specified slot number. See "Installing an Expansion Card" on page 44. If the problem persists, see "Getting Help" on page 95. |
| `PCI BIOS failed to install` | PCI device BIOS (Option ROM) checksum failure is detected during shadowing. Loose cables to expansion card(s); faulty or improperly installed expansion card. | Reseat the expansion cards. Ensure that all appropriate cables are securely connected to the expansion cards. If the problem persists, see "Troubleshooting an Expansion Card" on page 80. |
| `Plug & Play Configuration Error` | Error encountered in initializing PCI device; faulty system board. | Install the NVRAM_CLR jumper and reboot the system. See Figure 6-1 for jumper location. If the problem persists, see "Troubleshooting an Expansion Card" on page 80. |

**Table 1-6.    System Messages** *(continued)*

| Message | Causes | Corrective Actions |
|---------|--------|-------------------|
| `Read fault`<br><br>`Requested sector not found` | The operating system cannot read from the diskette or hard drive, the system could not find a particular sector on the disk, or the requested sector is defective. | Replace the diskette. Ensure that the diskette and hard drive cables are properly connected. See "Troubleshooting a USB Device" on page 71, "Troubleshooting an Optical Drive" on page 78, or "Troubleshooting a Hard Drive" on page 78 for the appropriate drive(s) installed in your system. |
| `Remote configuration update attempt failed` | System unable to process Remote Configuration request. | Retry Remote Configuration. |
| `ROM bad checksum = address` | Expansion card improperly installed or faulty. | Reseat the expansion cards. Ensure that all appropriate cables are securely connected to the expansion cards. If the problem persists, see "Troubleshooting an Expansion Card" on page 80. |
| `SATA port n hard disk drive not found` | SATA cables are not properly seated, or drive missing. | See "Troubleshooting a Hard Drive" on page 78. |
| `Sector not found`<br><br>`Seek error`<br><br>`Seek operation failed` | Faulty diskette or hard drive. | See "Troubleshooting a USB Device" on page 71 or "Troubleshooting a Hard Drive" on page 78 for the appropriate drive. |
| `Shutdown failure` | Shutdown test failure. | See "Troubleshooting System Memory" on page 76. |
| `The amount of system memory has changed` | Memory has been added or removed or a memory module may be faulty. | If memory has been added or removed, this message is informative and can be ignored. If memory has not been added or removed, check the SEL to determine if single-bit or multi-bit errors were detected and replace the faulty memory module. See "Troubleshooting System Memory" on page 76. |
| `This system supports only Opteron 2000 series processors.` | Microprocessor(s) is not supported by the system. | Install a supported microprocessor or microprocessor combination. See "Processors" on page 50. |
| `Time-of-day clock stopped` | Faulty battery or faulty chip. | See "Troubleshooting the System Battery" on page 74. |

**Table 1-6.  System Messages** *(continued)*

| Message | Causes | Corrective Actions |
| --- | --- | --- |
| `Time-of-day not set - please run SETUP program` | Incorrect Time or Date settings; faulty system battery. | Check the Time and Date settings. See "Using the System Setup Program" on page 23. If the problem persists, replace the system battery. See "System Battery" on page 59. |
| `Timer chip counter 2 failed` | Faulty system board. | See "Getting Help" on page 95. |
| `Unsupported CPU combination`<br><br>`Unsupported CPU stepping detected` | Microprocessor(s) is not supported by the system. | Install a supported microprocessor or microprocessor combination. See "Processors" on page 50. |
| `Utility partition not available` | The <F10> key was pressed during POST, but no utility partition exists on the boot hard drive. | Create a utility partition on the boot hard drive. See the CDs that came with your system. |
| `Warning: DIMM n and n are faulty and disabled. Total memory size is reduced!` | Faulty or improperly seated memory module(s). | See "Troubleshooting System Memory" on page 76. |
| `Warning! No microcode update loaded for processor n` | Microcode update failed. | Update the BIOS firmware. See "Getting Help" on page 95. |
| `Warning: One or more faulty DIMMs found on CPUn` | Faulty or improperly seated memory module(s) used by CPU*n*. | See "Troubleshooting System Memory" on page 76. |
| `Warning: The installed memory configuration is not optimal. For more information on valid memory configurations, please see the system documentation on the technical support web site.` | Invalid memory configuration. The system will run but with reduced functionality. | Ensure that the memory modules are installed in a valid configuration. See "Memory Module Installation Guidelines" on page 46. If the problem persists, see "Troubleshooting System Memory" on page 76. |
| `Write fault`<br><br>`Write fault on selected drive` | Faulty diskette, optical/diskette drive assembly, hard drive, or hard-drive subsystem. | See "Troubleshooting a USB Device" on page 71, "Troubleshooting an Optical Drive" on page 78, or "Troubleshooting a Hard Drive" on page 78. |

**NOTE:** For the full name of an abbreviation or acronym used in this table, see the "Glossary" on page 121.

# Warning Messages

A warning message alerts you to a possible problem and prompts you to respond before the system continues a task. For example, before you format a diskette, a message will warn you that you may lose all data on the diskette. Warning messages usually interrupt the task and require you to respond by typing y (yes) or n (no).

**NOTE:** Warning messages are generated by either the application or the operating system. For more information, see the documentation that accompanied the operating system or application.

# Diagnostics Messages

When you run system diagnostics, an error message may result. Diagnostic error messages are not covered in this section. Record the message on a copy of the Diagnostics Checklist in "Getting Help" on page 95, and then follow the instructions in that section for obtaining technical assistance.

# Alert Messages

Systems management software generates alert messages for your system. Alert messages include information, status, warning, and failure messages for drive, temperature, fan, and power conditions. For more information, see the systems management software documentation.

# 2

# Using the System Setup Program

After you set up your system, run the System Setup program to familiarize yourself with your system configuration and optional settings. Record the information for future reference.

You can use the System Setup program to:

- Change the system configuration stored in NVRAM after you add, change, or remove hardware
- Set or change user-selectable options—for example, the time or date
- Enable or disable integrated devices
- Correct discrepancies between the installed hardware and configuration settings

## Entering the System Setup Program

1. Turn on or restart your system.

2. Press <F2> immediately after you see the following message (you may have to press the <F2> key more than once):

   `<F2> = System Setup`

   If your operating system begins to load before you press <F2>, allow the system to finish booting, and then restart your system and try again.

   **NOTE:** To ensure an orderly system shutdown, see the documentation that accompanied your operating system.

### Responding to Error Messages

You can enter the System Setup program by responding to certain error messages. If an error message appears while the system is booting, make a note of the message. Before entering the System Setup program, see "System Messages" on page 16 for an explanation of the message and suggestions for correcting errors.

**NOTE:** After installing a memory upgrade, it is normal for your system to send a message the first time you start your system.

### Using the System Setup Program

Table 2-1 lists the keys that you use to view or change information on the System Setup program screens and to exit the program.

**Table 2-1.    System Setup Program Navigation Keys**

| Keys | Action |
| --- | --- |
| Up arrow or <Shift><Tab> | Moves to the previous field. |
| Down arrow or <Tab> | Moves to the next field. |
| Spacebar, <+>, <−>, left and right arrows | Cycles through the settings in a field. In many fields, you can also type the appropriate value. |
| <Enter> | From the main menu, selects an option that has a submenu, such as Memory Information. |
| <Esc> | From a submenu, returns the program to the main menu.<br>From the main menu, exits the System Setup program and restarts the system if any changes were made. |
| <F1> | Displays the System Setup program's help file. |

> **NOTE:** For most of the options, any changes that you make are recorded but do not take effect until you restart the system.

## System Setup Options

### Main Screen

When you enter the System Setup program, the main System Setup program screen appears (see Figure 2-1).

**Figure 2-1.   Main System Setup Program Screen**

```
        Dell Inc. (www.dell.com) - PowerEdge SC1435
                  BIOS Version: XX.XX.XX

 Service Tag : XXXXXXX             │  Asset Tag : XXXXXXXXXX

 System Time  ..........................................08:15:45
 System Date  ..........................................Sat September 2, 2006

 Memory Information  ..................................<ENTER>
 CPU Information  .....................................<ENTER>

 Boot Sequence .......................................<ENTER>
 Hard-Disk Drive Sequence .............................<ENTER>
 USB Flash Drive Emulation Type .......................<ENTER>

 Integrated Devices  ..................................<ENTER>
 PCI IRQ Assignment  ..................................<ENTER>

 Serial Communication  ................................<ENTER>

 System Security  .....................................<ENTER>

 Keyboard Numlock  ....................................<ENTER>
 Report Keyboard Errors  ..............................Report

 Up,Down Arrow to select  │  SPACE,+,- to change  │  ESC to exit  │  F1=Help
```

Table 2-2 lists the options and descriptions for the information fields that appear on the main System Setup program screen. For related information, see "System Security Screen Options" on page 29.

📝 **NOTE:** The options for the System Setup program change based on the system configuration.

📝 **NOTE:** The System Setup program defaults are listed under their respective options, where applicable.

**Table 2-2.   System Setup Program Options**

| Option | Description |
|---|---|
| System Time | Resets the time on the system's internal clock. |
| System Date | Resets the date on the system's internal calendar. |
| Memory Information | Displays information related to installed memory. See "Memory Information Screen" on page 27. |
| CPU Information | Displays information related to microprocessors (speed, cache size, and so on). See "CPU Information Screen" on page 27. |

**Table 2-2. System Setup Program Options** *(continued)*

| Option | Description |
|---|---|
| Boot Sequence | Determines the order in which the system searches for boot devices during system startup. Available options can include the diskette drive, CD drive, hard drives, and network.<br><br>**NOTE:** System boot is not supported from an external device attached to a SAS or SCSI adapter. See support.dell.com for the latest support information about booting from external devices. |
| Hard-Disk Drive Sequence | Determines the order in which the system searches the hard drives during system startup. The selections depend on the hard drives installed in your system. |
| USB Flash Drive Emulation Type (**Auto** default) | Determines the emulation type for a USB flash drive. **Hard disk** allows the USB flash drive to act as a hard drive. **Floppy** allows the USB flash drive to act as a removal diskette drive. **Auto** automatically chooses an emulation type. |
| Boot Sequence Retry | If this field is enabled and the system has failed to boot, the system will reattempt to boot after 30 seconds. |
| Integrated Devices | See "Integrated Devices Screen" on page 28. |
| PCI IRQ Assignment | Displays a screen to change the IRQ assigned to each of the integrated devices on the PCI bus, and any installed expansion card that requires an IRQ. |
| Serial Communication (**Off** default) | Options are **On with Console Redirection** via COM2, and **Off**. |
| System Security | Displays a screen to configure the system password and setup password features. See "System Security Screen" on page 29, "Using the System Password" on page 30, and "Using the Setup Password" on page 32 for more information. |
| Keyboard NumLock (**On** default) | Determines whether your system starts up with the NumLock mode activated on 101- or 102-key keyboards (does not apply to 84-key keyboards). |
| Report Keyboard Errors (**Report** default) | Enables or disables reporting of keyboard errors during the POST. Select **Report** for host systems that have keyboards attached. Select **Do Not Report** to suppress all error messages relating to the keyboard or keyboard controller during POST. This setting does not affect the operation of the keyboard itself if a keyboard is attached to the system. |

## Memory Information Screen

Table 2-3 lists the descriptions for the information fields that appear on the **Memory Information** screen.

**Table 2-3. Memory Information Screen**

| Option | Description |
|---|---|
| System Memory Size | Displays the amount of system memory. |
| System Memory Type | Displays the type of system memory. |
| System Memory Speed | Displays the system memory speed. |
| Video Memory | Displays the amount of video memory. |
| System Memory Testing | This option determines whether system memory tests are run at system boot. Options are **Enabled** and **Disabled**. |
| Node Interleaving | If this field is enabled, memory interleaving is supported if a symmetric memory configuration is installed. If this field is set to disabled (the default), the system can support Non-Uniform Memory Architecture (NUMA) memory access. See "Memory Module Installation Guidelines" on page 46. |

## CPU Information Screen

Table 2-4 lists the options and descriptions for the information fields that appear on the **CPU Information** screen.

**Table 2-4. CPU Information Screen**

| Option | Description |
|---|---|
| 64-bit | Specifies if the installed processor(s) support 64-bit extensions. |
| Core Speed | Displays the clock speed of the processor(s). |
| Bus Speed | Displays the bus speed of the processor(s). |
| Demand-Based Power Management (**Disabled** default) | Enables or disables demand-based power management. When enabled, the CPU Performance State tables will be reported to the operating system; when disabled, the CPU Performance State tables will not be reported to the operating system. If any of the CPUs do not support demand-based power management, the field will become read-only, and automatically set to **Disabled**. |
| Processor X ID | Displays the model number of the processor. A submenu displays the amount of level 2 cache and number of cores. |

**Enabling AMD™ PowerNow!™ Technology**

PowerNow! technology controls your system's processor performance automatically, dynamically adjusting the operating frequency and voltage according to the task at hand. When an application does not require full performance, significant amounts of power can be saved. Performance is designed to still be responsive, with maximum processor performance being delivered when required, and automatic power savings when possible. (PowerNow! support is dependent on the operating system and version used on your system.)

To enable the PowerNow! feature, run the System Setup Program and enable the **Demand-Based Power Management** option on the **CPU Information** screen.

Additionally, for Microsoft® Windows® operating systems, you will need to install the PowerNow! driver to enable this feature. The driver is available on the Dell OpenManage *Service and Diagnostic CD* provided with your system and at **support.dell.com**.

**Integrated Devices Screen**

Table 2-5 lists the options and descriptions for the information fields that appear on the **Integrated Devices** screen.

**Table 2-5.   Integrated Devices Screen Options**

| Option | Description |
|---|---|
| Embedded SATA Controller (**Off** default) | Allows the integrated SATA controller to be set to **Off** or **ATA** mode. |
| IDE CD-ROM Controller (**Auto** default) | Enables the integrated IDE controller. When set to **Auto**, each channel of the integrated IDE controller is enabled if IDE devices are attached to the channel and an external IDE controller is not detected. **NOTE:** This CD-ROM option will not appear on this menu screen if your system does not include this optional device. |
| User-Accessible USB Ports (**All Ports On** default) | Enables or disables the system's user-accessible ports. Options are **All Ports On** or **All Ports Off**. Disabling the USB ports makes system resources available for other devices. |
| Embedded Gb NIC1 (**Enabled with PXE** default) | Enables or disables the system's integrated NIC1. Options are **Enabled without PXE**, **Enabled with PXE**, and **Disabled**. PXE support allows the system to boot from the network. Changes take effect after the system reboots. |
| MAC Address | Displays the MAC address for NIC1. This field does not have user-selectable settings. |
| Embedded Gb NIC2 (**Enabled without PXE** default) | Enables or disables the system's integrated NIC2. Options are **Enabled without PXE**, **Enabled with PXE**, and **Disabled**. PXE support allows the system to boot from the network. Changes take effect after the system reboots. |
| MAC Address | Displays the MAC address for NIC2. This field does not have user-selectable settings. |

## System Security Screen

Table 2-6 lists the options and descriptions for the information fields that appear on the **System Security** screen.

**Table 2-6.    System Security Screen Options**

| Option | Description |
| --- | --- |
| System Password | Displays the current status of your system's password security feature and allows you to assign and verify a new system password.<br><br>**NOTE:** See "Using the System Password" on page 30 for instructions on assigning a system password and using or changing an existing system password. |
| Setup Password | Restricts access to the System Setup program in the same way that you restrict access to your system using the system password feature.<br><br>**NOTE:** See "Using the Setup Password" on page 32 for instructions on assigning a setup password and using or changing an existing setup password. |
| Password Status | Setting the **Setup Password** option to **Enabled** prevents the system password from being changed or disabled at system start-up.<br><br>To *lock* the system password, assign a setup password in the **Setup Password** option and then change the **Password Status** option to **Locked**. In this state, you cannot change the system password using the **System Password** option and cannot be disabled at system start-up by pressing <Ctrl><Enter>.<br><br>To *unlock* the system password, enter the setup password in the **Setup Password** field and then change the **Password Status** option to **Unlocked**. In this state, you can disable the system password at system start-up by pressing <Ctrl><Enter> and then change the password using the **System Password** option. |
| Power Button | Turns system's power off and on.<br>• If you turn off the system using the power button and the system is running an ACPI-compliant operating system, the system can perform an orderly shutdown before power is turned off.<br>• If the system is not running an ACPI-compliant operating system, power is turned off immediately after the power button is pressed.<br><br>The button is enabled in the System Setup program. When disabled, the button can only turn on system power.<br><br>**NOTE:** You can still turn on the system by using the power button, even if the **Power Button** option is set to **Disabled**. |
| NMI Button | **NOTICE:** Use the NMI button only if directed to do so by qualified support personnel or by the operating system's documentation. Pressing this button halts the operating system and displays a diagnostic screen.<br><br>Enables or disables the NMI feature. |

**Table 2-6. System Security Screen Options** *(continued)*

| Option | Description |
|---|---|
| AC Power Recovery (**Last** default) | Determines how the system reacts when power is restored to the system. If system is set to **Last**, the system returns to the last power state. **On** turns on the system after power is restored. When set to **Off**, the system remains off after power is restored. |

## Exit Screen

After you press <Esc> to exit the System Setup program, the **Exit** screen displays the following options:

- Save Changes and Exit
- Discard Changes and Exit
- Return to Setup

# System and Setup Password Features

⊖ **NOTICE:** The password features provide a basic level of security for the data on your system. If your data requires more security, use additional forms of protection, such as data encryption programs.

⊖ **NOTICE:** Anyone can access the data stored on your system if you leave the system running and unattended without having a system password assigned or if you leave your system unlocked so that someone can disable the password by changing a jumper setting.

Your system is shipped to you without the system password feature enabled. If system security is a concern, operate your system only with system password protection.

To change or delete an existing password, you must know the password (see "Deleting or Changing an Existing System Password" on page 32). If you forget your password, you cannot operate your system or change settings in the System Setup program until a trained service technician changes the password jumper setting to disable the passwords, and erases the existing passwords. This procedure is described in "Disabling a Forgotten Password" on page 90.

## Using the System Password

After a system password is assigned, only those who know the password have full use of the system. When the **System Password** option is set to **Enabled**, the system prompts you for the system password after the system starts.

### Assigning a System Password

Before you assign a system password, enter the System Setup program and check the **System Password** option.

When a system password is assigned, the setting shown for the **System Password** option is **Enabled**. If the setting shown for the **Password Status** is **Unlocked**, you can change the system password. If the **Password Status** option is **Locked**, you cannot change the system password. When the system password feature is disabled by a jumper setting, the system password is **Disabled**, and you cannot change or enter a new system password.

When a system password is not assigned and the password jumper on the system board is in the enabled (default) position, the setting shown for the **System Password** option is **Not Enabled** and the **Password Status** field is **Unlocked**. To assign a system password:

1   Verify that the **Password Status** option is set to **Unlocked**.

2   Highlight the **System Password** option and press <Enter>.

3   Type your new system password.

   You can use up to 32 characters in your password.

   As you press each character key (or the spacebar for a blank space), a placeholder appears in the field.

   The password assignment is not case-sensitive. However, certain key combinations are not valid. To erase a character when entering your password, press <Backspace> or the left-arrow key.

   **NOTE:** To escape from the field without assigning a system password, press <Enter> to move to another field, or press <Esc> at any time prior to completing step 5.

4   Press <Enter>.

5   To confirm your password, type it a second time and press <Enter>.

   The setting shown for the **System Password** changes to **Enabled**. Exit the System Setup program and begin using your system.

6   Either reboot your system now for your password protection to take effect or continue working.

   **NOTE:** Password protection does not take effect until you reboot the system.

### Using Your System Password to Secure Your System

**NOTE:** If you have assigned a setup password (see "Using the Setup Password" on page 32"), the system accepts your setup password as an alternate system password.

When the **Password Status** option is set to **Unlocked**, you have the option to leave the password security enabled or to disable the password security.

To leave the password security enabled:

1   Turn on or reboot your system by pressing <Ctrl><Alt><Del>.

2   Type your password and press <Enter>.

To disable the password security:

1   Turn on or reboot your system by pressing <Ctrl><Alt><Del>.

2   Type your password and press <Ctrl><Enter>.

When the **Password Status** option is set to **Locked** whenever you turn on your system or reboot your system by pressing <Ctrl><Alt><Del>, type your password and press <Enter> at the prompt.

After you type the correct system password and press <Enter>, your system operates as usual.

If an incorrect system password is entered, the system displays a message and prompts you to re-enter your password. You have three attempts to enter the correct password. After the third unsuccessful attempt, the system displays an error message showing the number of unsuccessful attempts and that the system has halted and will shut down. This message can alert you to an unauthorized person attempting to use your system.

Even after you shut down and restart the system, the error message continues to be displayed until the correct password is entered.

*Ø* **NOTE:** You can use the Password Status option in conjunction with the System Password and Setup Password options to further protect your system from unauthorized changes.

### Deleting or Changing an Existing System Password

1 When prompted, press <Ctrl><Enter> to disable the existing system password.

   If you are asked to enter your setup password, contact your network administrator.

2 Enter the System Setup program by pressing <F2> during POST.

3 Select the **System Security** screen field to verify that the **Password Status** option is set to **Unlocked**.

4 When prompted, type the system password.

5 Confirm that **Not Enabled** is displayed for the **System Password** option.

   If **Not Enabled** is displayed for the **System Password** option, the system password has been deleted. If **Enabled** is displayed for the **System Password** option, press the <Alt><b> key combination to restart the system, and then repeat steps 2 through 5.

## Using the Setup Password

Read the information in the following sections to assign or change your setup password.

### Assigning a Setup Password

You can assign (or change) a setup password only when the **Setup Password** option is set to **Not Enabled**. To assign a setup password, highlight the **Setup Password** option and press the <+> or <–> key. The system prompts you to enter and verify the password. If a character is illegal for password use, the system beeps.

*Ø* **NOTE:** The setup password can be the same as the system password. If the two passwords are different, the setup password can be used as an alternate system password. However, the system password cannot be used in place of the setup password.

You can use up to 32 characters in your password.

As you press each character key (or the spacebar for a blank space), a placeholder appears in the field.

The password assignment is not case-sensitive. However, certain key combinations are not valid. If you enter one of these combinations, the system beeps. To erase a character when entering your password, press <Backspace> or the left-arrow key.

After you verify the password, the **Setup Password** setting changes to **Enabled**. The next time you enter the System Setup program, the system prompts you for the setup password.

A change to the **Setup Password** option becomes effective immediately (restarting the system is not required).

### Operating With a Setup Password Enabled

If **Setup Password** is set to **Enabled**, you must enter the correct setup password before you can modify most of the System Setup options. When you start the System Setup program, the program prompts you to enter a password.

If you do not enter the correct password in three attempts, the system lets you view, but not modify, the System Setup screens—with the following exception: If **System Password** is not set to **Enabled** and is not locked through the **Password Status** option, you can assign a system password.

**NOTE:** You can use the Password Status option in conjunction with the Setup Password option to protect the system password from unauthorized changes.

### Deleting or Changing an Existing Setup Password

1  Enter the System Setup program and select the **System Security** option.

2  Highlight the **Setup Password** option, press <Enter> to access the setup password window, and press <Enter> twice to clear the existing setup password.

   The setting changes to **Not Enabled**.

3  If you want to assign a new setup password, perform the steps in "Assigning a Setup Password" on page 32.

# Disabling a Forgotten Password

See "Disabling a Forgotten Password" on page 90.

# Baseboard Management Controller Configuration

The Baseboard Management Controller (BMC) enables configuring, monitoring, and recovery of systems remotely. BMC provides the following features:

• Uses the system's integrated NIC

• Fault logging and SNMP alerting

• Access to system event log and sensor status

• Control of system functions including power on and off

- Support is independent of the system's power or operating state

- Provides text console redirection for system setup, text-based utilities, and operating system consoles

**NOTE:** To remotely access the BMC through the integrated NIC, you must connect the network connection to integrated NIC1.

For additional information on using BMC, see the documentation for the BMC and systems management applications.

## Entering the BMC Setup Module

**1** Turn on or restart your system.

**2** Press <Ctrl-E> when prompted after POST.

If your operating system begins to load before you press <Crtl-E>, allow the system to finish booting, and then restart your system and try again.

## BMC Setup Module Options

For information about the BMC Setup Module options and how to configure the emergency management port (EMP), see the *BMC User's Guide*.

# 3

# Installing System Components

This section describes how to install the following system components:

- Front bezel
- System cover
- Cooling shroud
- Cooling fan modules
- Power supply
- Expansion cards
- System memory
- Processors
- Optical drive
- Hard drives
- Boot drive
- SAS controller card
- System battery
- Risers
- Control panel assembly
- System board

## Recommended Tools

You may need the following items to perform the procedures in this section:

- Key to the system keylock
- #2 Phillips screwdriver
- T10 Torx driver
- Small flat-blade screwdriver
- Wrist grounding strap

# Inside the System

⚠️ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

⚠️ **CAUTION: The memory modules can become extremely hot during normal operation. Allow the modules sufficient time to cool before handling.**

In Figure 3-1, the bezel, system cover, and cooling shroud are removed to provide an interior view of the system.

**Figure 3-1.  Inside the System**
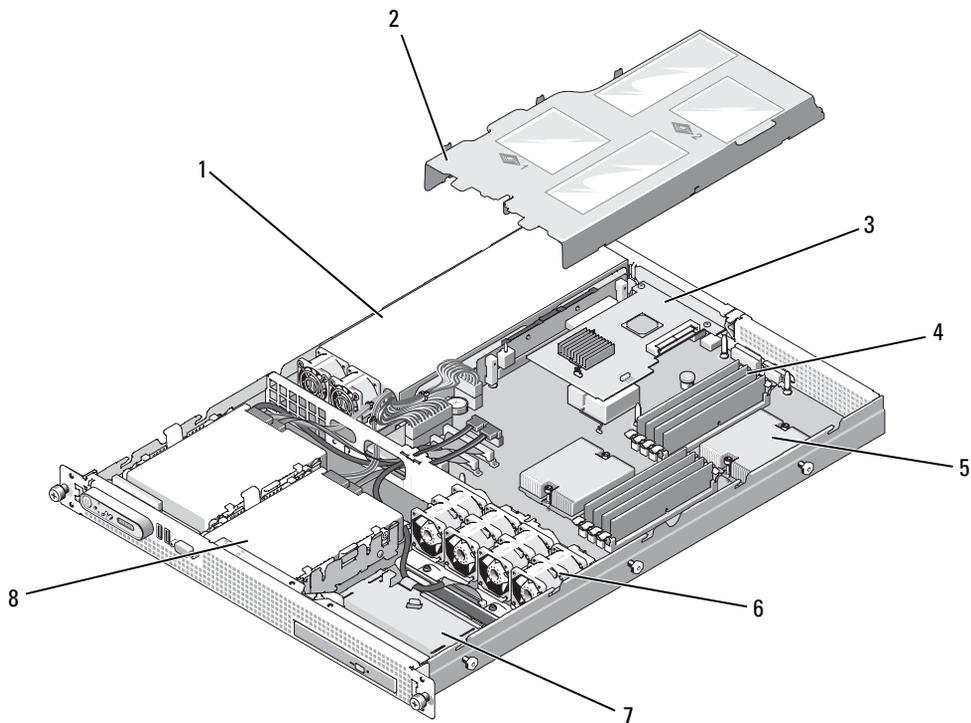


| 1 | power supply | 2 | cooling shroud | 3 | expansion card |
|---|---|---|---|---|---|
| 4 | memory modules (8) | 5 | heatsink/microprocessor (2) | 6 | cooling fan modules (2) |
| 7 | optical drive (optional) | 8 | 3.5-inch hard drive bays (2) | | |

Several hardware options, such as the microprocessors and memory, are installed directly on the system board. The riser card accommodates one half-length expansion card. For more information, see "Expansion Cards" on page 44.

The system provides space for one optional slimline optical drive. For more information, see "Installing the Optical Drive in the System" on page 54.

The hard-drive bays provide space for one or two 3.5-inch hard drives. The hard drives connect to the SATA controller or the system board, or an optional SAS controller card. For more information, see "Hard Drives" on page 55.

During an installation or troubleshooting procedure, you may be required to change a jumper setting. For more information, see "Jumpers and Connectors" on page 89.

✍ **NOTE:** There are no hot-pluggable components inside this system.

## Removing and Replacing the Front Bezel

The system front panel is enclosed by an optional bezel. To access the optional optical drive, you must remove the bezel.

✍ **NOTE:** You do not need to remove the front bezel to remove the system cover and access internal components.

1 Using the system key, unlock the bezel.
2 Press the tab at the left end of the bezel.
3 Rotate the left end of the bezel away from the system to release the right end of the bezel.
4 Pull the bezel away from the system. See Figure 3-2.

**Figure 3-2. Removing the Bezel**



| 1 | key lock | 2 | bezel |
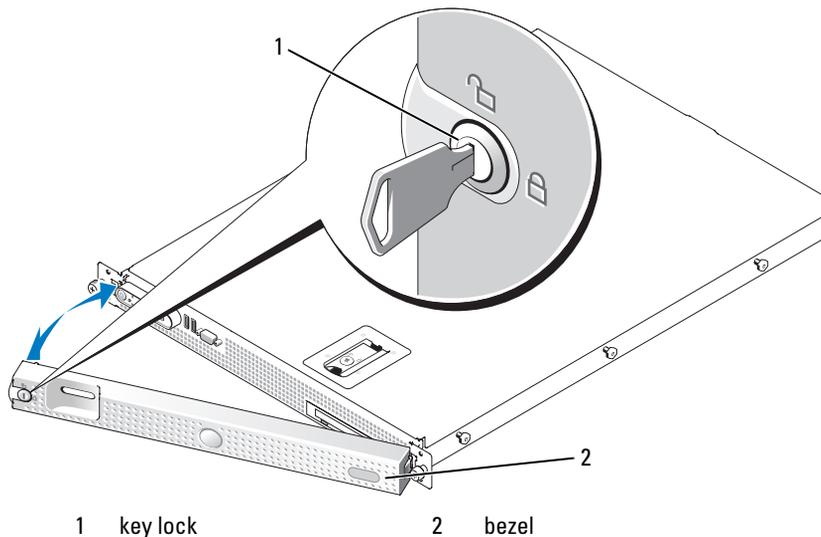
To replace the front bezel, perform the preceding steps in reverse.

# Opening and Closing the System

⚠️ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

⚠️ **CAUTION: Whenever you need to lift the system, get others to assist you. To avoid injury, do not attempt to lift the system by yourself.**

⚠️ **CAUTION: The memory modules can become extremely hot during normal operation. Allow the modules sufficient time to cool before handling.**

## Opening the System

To upgrade or troubleshoot the system, remove the system cover to gain access to internal components.

1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.

2 Rotate the latch release lock on the latch in a counter clockwise direction to the unlocked position. See Figure 3-3.

3 Lift up on the latch on top of the system and slide the cover back. See Figure 3-3.

4 Grasp the cover on both sides and carefully lift the cover away from the system.

**Figure 3-3.    Removing the Cover**



| 1 | latch | 2 | latch release lock | 3 | J hooks |

### Closing the System

**1** Lift up the latch on the cover.

**2** Align the cover with the left and right edges of the system and offset it slightly towards the back of the system, so that the pins on the inner edge of the cover are aligned with the chassis J hooks. See Figure 3-3.

**3** Lower the cover onto the chassis and close the latch.

**4** Rotate the latch release lock in a clockwise direction to secure the cover.

# Cooling Shroud

The cooling shroud covers the memory modules (DIMMs) and the processor(s).

### Removing the Cooling Shroud
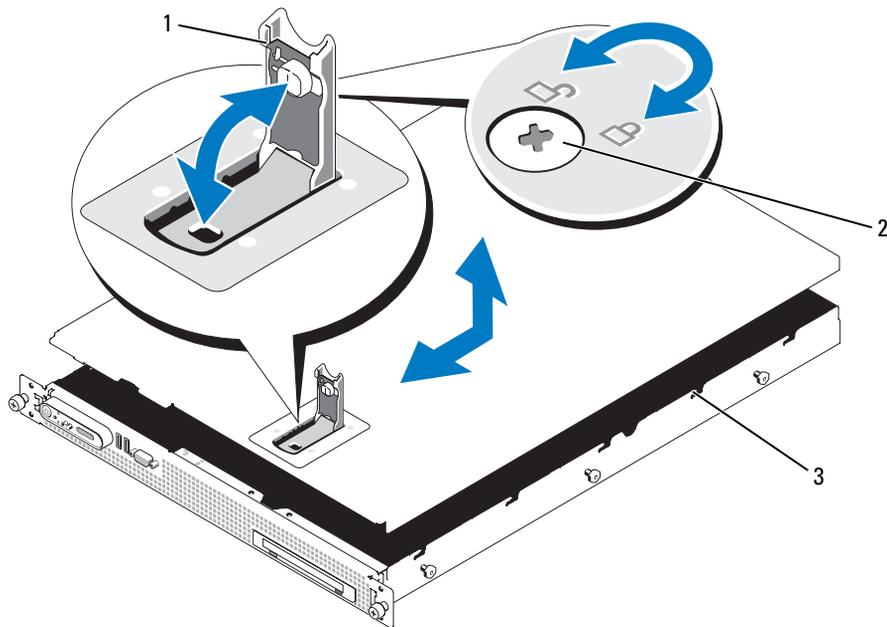
⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

⚠ **CAUTION: The memory modules are hot to the touch for some time after the system has been powered down. Allow time for the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components on the memory module.**

⊘ **NOTICE:** Never operate your system with the cooling shroud removed. Overheating of the system can develop quickly resulting in a shutdown of the system and the loss of data.

**1** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.

**2** Open the system. See "Opening and Closing the System" on page 38.

**3** Grasp the shroud by the blue lift points and carefully lift the shroud straight up and away from the system. See Figure 3-4.

**Figure 3-4.    Cooling Shroud**
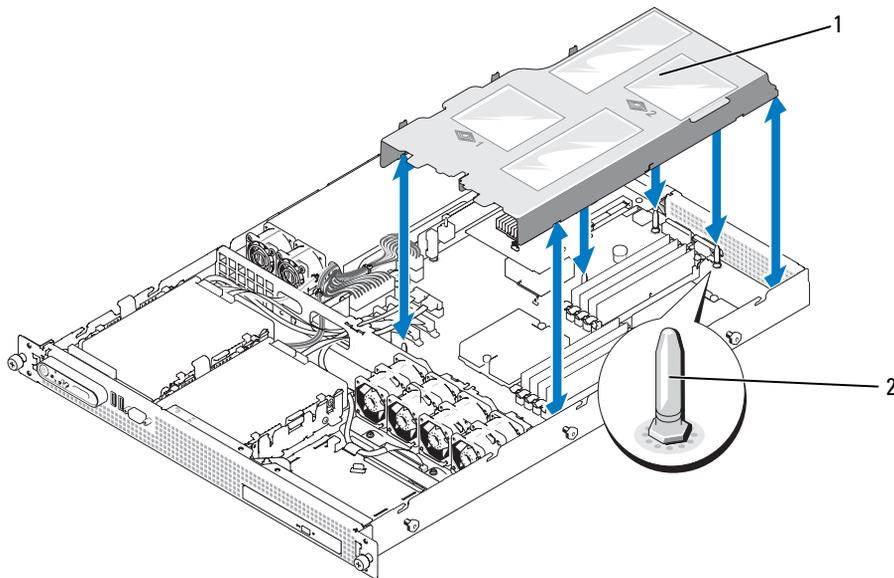


| 1 | cooling shroud | 2 | locator pins (6) |

### Replacing the Cooling Shroud

**1** To install the cooling shroud, align the edges of the shroud with the six locator pins on the system board. See Figure 3-4.

**2** Lower the shroud into place over the system board.

**3** Close the system. See "Opening and Closing the System" on page 38.

## Cooling Fan Modules

This system contains two cooling fan modules, each comprised of two dual-rotor fans.

### Removing a Cooling Fan Module

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

**1** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.

**2** Open the system. See "Opening and Closing the System" on page 38.

**3** Remove the cooling shroud. See "Removing the Cooling Shroud" on page 39.

**4** Unplug the fan module power connector from the system board. See Figure 3-5.

**5** Remove the screw from the fan module retention plate and remove the retention plate from the chassis.

**6** Lift the fan module straight up from the chassis.

**Figure 3-5.   Removing and Installing a Cooling Fan Module**
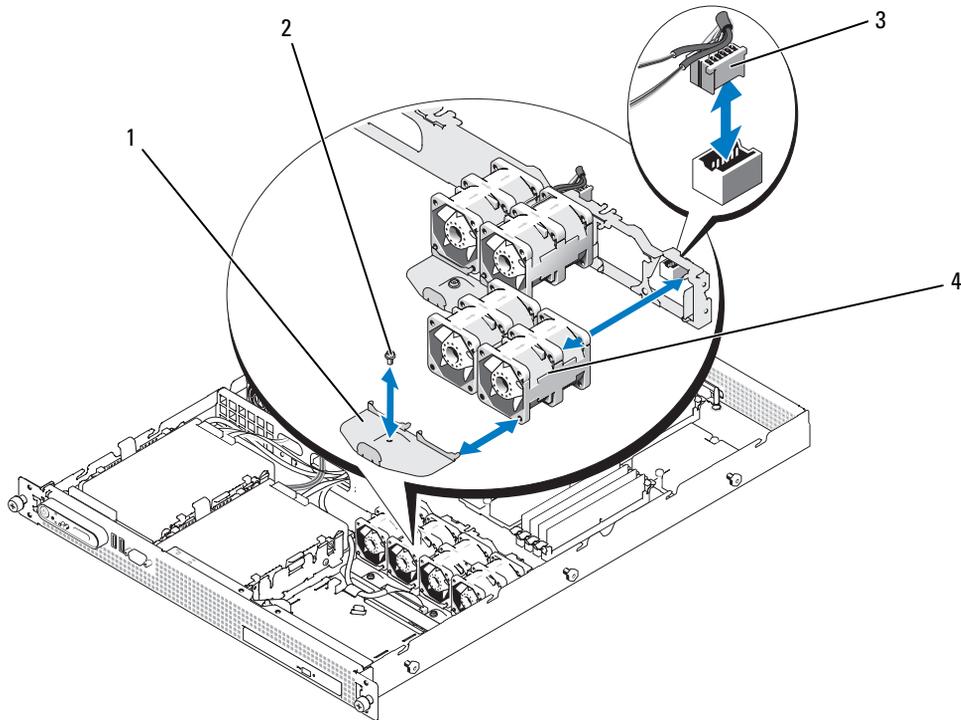


| | | | | | |
|---|---|---|---|---|---|
| 1 | fan module retention plates (2) | 2 | retention plate screw (2) | 3 | fan power cable |
| 4 | cooling fan modules (2) | | | | |

### Replacing a Cooling Fan Module

**1** With the fan module label facing upwards and the arrow on the fan module pointing towards the back of the system, place the fan module into the chassis. See Figure 3-5.

**2** Reinstall the fan module retention plate. The four pins on the plate fit into the corresponding holes in the fan modules.

**3** Secure the retention plate with the Phillips screw.

**4** Connect the fan module power cable to the power connector on the system board.

Ensure that the fan module power cable is resting in the notch in the chassis brace.

**5** Reinstall the cooling shroud. See "Replacing the Cooling Shroud" on page 40.

**6** Close the system. See "Opening and Closing the System" on page 38.

# Power Supply

### Removing the Power Supply

**1** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.

**2** Open the system. See "Opening and Closing the System" on page 38.

**3** Disconnect the power cable from the power supply and remove the cable from the cable retention bracket.

**NOTICE:** On a rack system, you may need to temporarily unlatch and lift the cable management arm. For information about the cable management arm, see the system's *Rack Installation Guide*.

**4** Disconnect the two power supply cables from the POWER1 and POWER2 connectors on the system board. See Figure 6-1.

**5** If applicable, disconnect the hard drive power cables from the hard drive(s).

**6** Remove the screw at the front of the power supply that secures the power supply to the chassis. See Figure 3-6.

**7** Slide the power supply toward the front of the system and remove it from the system.

**Figure 3-6.   Removing and Installing a Power Supply**
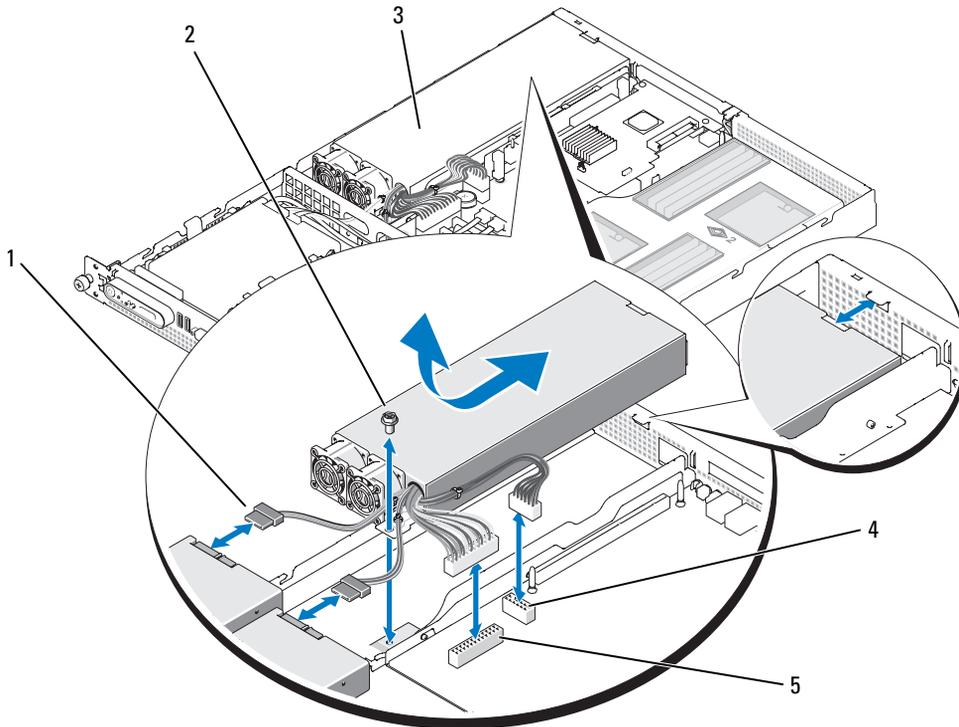


| | | | | | |
|---|---|---|---|---|---|
| 1 | hard-drive power cables (2) | 2 | retention screw | 3 | power supply |
| 4 | POWER2 connector | 5 | POWER1 connector | | | |

## Installing the Power Supply

**NOTICE:** On a rack system, you may need to temporarily unlatch and lift the cable management arm. For information about the cable management arm, see the system's *Rack Installation Guide*.

**NOTICE:** For more information about the power cable retention bracket, see *Getting Started With Your System*.

1 Lower the power supply into the system and slide the power supply into place against the back panel of the system. See Figure 3-6.

2 Reinstall the screw that secures the power supply to the chassis.

3 Connect the two power supply cables to the POWER1 and POWER2 connectors on the system board. See Figure 3-6.

4 If applicable, route the hard drive power cables through the oval opening in the chassis brace and connect them to the hard drives.

5 Close the system. See "Closing the System."

# Expansion Cards

The system supports one half-length expansion card. Two different PCI riser board configurations are available:

- The PCIe riser has one x8-lane width PCIe expansion slot.
- The PCI-X riser has one 64-bit/133-MHz expansion slot.

## Installing an Expansion Card

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

1  Unpack the expansion card and prepare it for installation.

   For instructions, see the documentation accompanying the card.

2  Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

3  Open the system. See "Opening and Closing the System" on page 38.

4  If you are adding a new card, open the expansion-card latch and remove the filler bracket. See Figure 3-7.

5  Install the expansion card. See Figure 3-7.

   a  Position the expansion card so that the card-edge connector aligns with the expansion-card connector on the riser board.

   b  Insert the card-edge connector firmly into the expansion-card connector until the card is fully seated.

   c  When the card is seated in the connector, close the expansion-card latch.

6  Connect any cables to the expansion card.

   ⊘ **NOTICE:** *If you are installing a SAS RAID controller card,* route the SAS cables though the oval opening in the chassis brace and connect the cables to the SAS connectors on the hard drives. Secure the cables to the clips on the edge of the cooling shroud.

   See the documentation that came with the card for information about its cable connections.

7  Close the system. See "Opening and Closing the System" on page 38.

**Figure 3-7. Installing an Expansion Card**



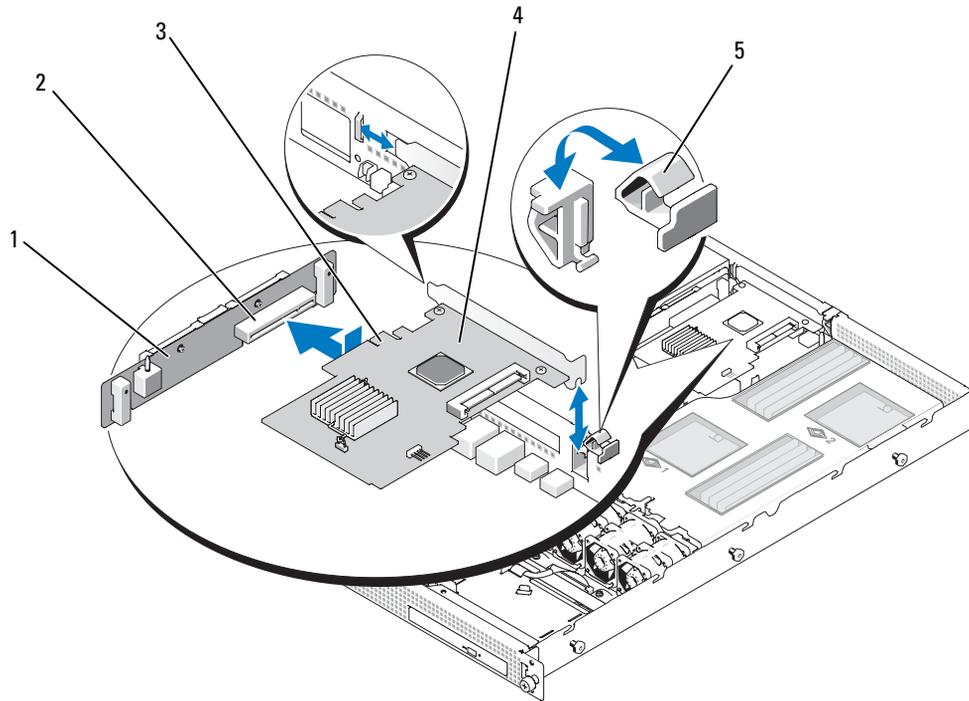| 1 | riser board | 2 | expansion-card connector | 3 | card-edge connector |
|---|---|---|---|---|---|
| 4 | expansion card | 5 | expansion-card latch | | |

## Removing an Expansion Card

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

1 Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2 Open the system. See "Opening and Closing the System" on page 38.

3 Disconnect all cables from the card.

4 Remove the expansion card:

   **a** Open the expansion-card latch. See Figure 3-7.

   **b** Grasp the expansion card by its edges, and carefully remove it from the expansion-card connector.

**5** If you are removing the card permanently, install a metal filler bracket over the empty expansion slot opening and close the expansion-card latch.

> ✍ **NOTE:** You must install a filler bracket over an empty expansion slot to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.

**6** Close the system. See "Opening and Closing the System" on page 38.

# System Memory

You can upgrade your system memory to a maximum of 32 GB by installing 667-MHz registered DDR-II memory modules (DIMMs) in sets of 512-MB, 1-GB, 2-GB, or 4-GB modules. The eight memory sockets are located on the system board under the cooling shroud. Each processor has four memory channels, organized in sets of two channels.

Your system hardware supports Non-Uniform Memory Architecture (NUMA) if two processors are installed. Each processor has its own memory controller and local memory for reduced access times, but it can also access memory from another processor. This architecture improves system performance if an operating system is installed that supports this feature.

> ⊘ **NOTICE:** To enable NUMA, run the System Setup program and disable the **Node Interleaving** option. See "Using the System Setup Program" on page 23.

## Memory Module Installation Guidelines

To ensure optimal performance of your system, observe the following guidelines when configuring your system memory.

- Memory modules must be installed in pairs, beginning with DIMM1 and DIMM2 (processor 1), and DIMM5 and DIMM6 (processor 2).
- The memory modules must be identical in speed and technology. The DIMMs in each pair must be the same size.

## Sample Memory Configurations

### Dual-Processor Memory Configurations

You can use the following configurations in a dual-processor system.

**Table 3-1. Dual-Processor Memory Configurations**

| Total System Memory | CPU 1 | | | | CPU2 | | | |
|---|---|---|---|---|---|---|---|---|
| | DIMM1 | DIMM2 | DIMM3 | DIMM4 | DIMM5 | DIMM6 | DIMM7 | DIMM8 |
| 2 GB | 512 MB | 512 MB | | | 512 MB | 512 MB | | |
| 4 GB | 512 MB | 512 MB | 512 MB | 512 MB | 512 MB | 512 MB | 512 MB | 512 MB |
| 4 GB | 1 GB | 1 GB | | | 1 GB | 1 GB | | |
| 6 GB | 1 GB | 1 GB | 512 MB | 512 MB | 1 GB | 1 GB | 512 MB | 512 MB |
| 8 GB | 1 GB | 1 GB | 1 GB | 1 GB | 1 GB | 1 GB | 1 GB | 1 GB |
| 8 GB | 2 GB | 2 GB | | | 2 GB | 2 GB | | |
| 12 GB | 2 GB | 2 GB | 1 GB | 1 GB | 2 GB | 2 GB | 1 GB | 1 GB |
| 16 GB | 2 GB | 2 GB | 2 GB | 2 GB | 2 GB | 2 GB | 2 GB | 2 GB |
| 24 GB | 4 GB | 4 GB | 2 GB | 2 GB | 4 GB | 4 GB | 2 GB | 2 GB |
| 32 GB | 4 GB | 4 GB | 4 GB | 4 GB | 4 GB | 4 GB | 4 GB | 4 GB |

**Single-Processor Memory Configurations**

You can use the following configurations in a single-processor system.

**Table 3-2. Single-Processor Memory Configurations**

| Total System Memory | CPU 1 | | | |
|---|---|---|---|---|
| | DIMM1 | DIMM2 | DIMM3 | DIMM4 |
| 1 GB | 512 MB | 512 MB | | |
| 2 GB | 512 MB | 512 MB | 512 MB | 512 MB |
| 2 GB | 1 GB | 1 GB | | |
| 3 GB | 1 GB | 1 GB | 512 MB | 512 MB |
| 4 GB | 1 GB | 1 GB | 1 GB | 1 GB |
| 4 GB | 2 GB | 2 GB | | |
| 6 GB | 2 GB | 2 GB | 1 GB | 1 GB |
| 8 GB | 2 GB | 2 GB | 2 GB | 2 GB |
| 12 GB | 4 GB | 4 GB | 2 GB | 2 GB |
| 16 GB | 4 GB | 4 GB | 4 GB | 4 GB |

## Non-Optimal Memory Configurations

System performance can be affected if your memory configuration does not conform to the preceding installation guidelines. Your system may issue an error message during startup stating that your memory configuration is non-optimal.

## Installing Memory Modules

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

⚠ **CAUTION: The memory modules are hot to the touch for some time after the system has been powered down. Allow time for the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components on the memory module.**

1 Open the system. See "Opening and Closing the System" on page 38.

2 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 39.

3 Locate the memory module sockets. See Figure 6-2.

4 Press the ejectors on the memory module socket down and out, as shown in Figure 3-8, to allow the memory module to be inserted into the socket.

5 Handle each memory module only on either card edge, ensuring not to touch the middle of the memory module.

**Figure 3-8. Installing and Removing a Memory Module**



| 1 | memory module | 2 | memory module socket ejectors (2) | 3 | alignment key |
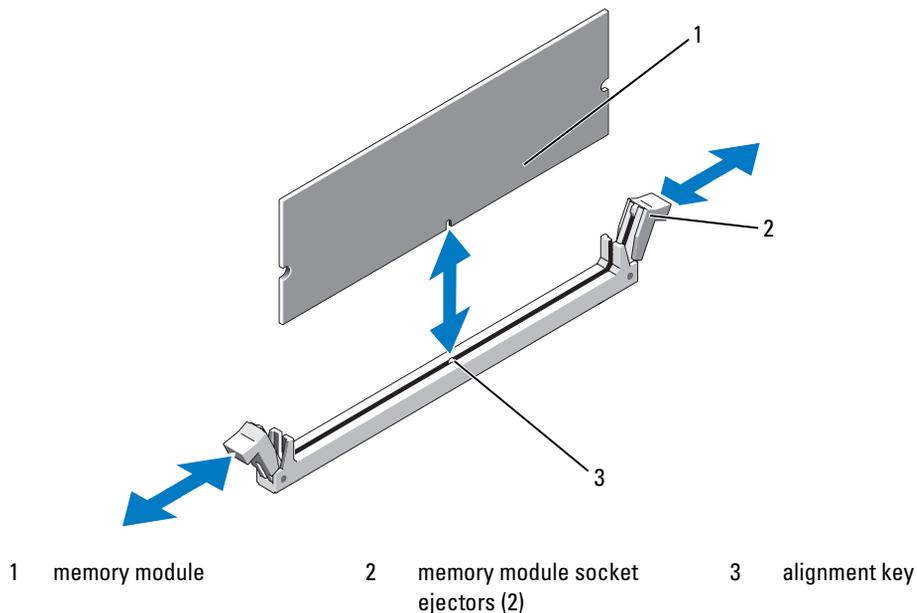
**6** Align the memory module's edge connector with the alignment key of the memory module socket, and insert the memory module in the socket.

> **NOTE:** The memory module socket has an alignment key that allows you to install the memory module in the socket in only one way.

**7** Press down on the memory module with your thumbs while pulling up on the ejectors with your index fingers to lock the memory module into the socket.

When the memory module is properly seated in the socket, the ejectors on the memory module socket align with the ejectors on the other sockets that have memory modules installed.

**8** Repeat step 3 through step 7 of this procedure to install the remaining memory modules. See "Dual-Processor Memory Configurations" on page 46 or "Single-Processor Memory Configurations" on page 47 for supported memory configurations.

**9** Replace the cooling shroud. See "Replacing the Cooling Shroud" on page 40.

**10** Close the system. See "Opening and Closing the System" on page 38.

**11** Restart the system, press <F2> when prompted to enter the System Setup program, and check the **System Memory** setting on the main **System Setup** screen.

The system should have already changed the value to reflect the newly installed memory.

**12** If the value is incorrect, one or more of the memory modules may not be installed properly. Repeat step 1 through step 11 of this procedure, checking to ensure that the memory modules are firmly seated in their sockets.

**13** Run the system memory test in the system diagnostics. See "Running the System Diagnostics" on page 85.

### Removing Memory Modules

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

⚠ **CAUTION: The memory modules are hot to the touch for some time after the system has been powered down. Allow time for the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components on the memory module.**

**1** Open the system. See "Opening and Closing the System" on page 38.

**2** Remove the cooling shroud. See "Removing the Cooling Shroud" on page 39.

**3** Locate the memory module sockets. See Figure 6-2.

**4** Press down and out on the ejectors on each end of the socket until the memory module pops out of the socket. See Figure 3-8.

Handle each memory module only on either card edge, ensuring not to touch the middle of the memory module.

**5** Replace the cooling shroud. See "Replacing the Cooling Shroud" on page 40.

**6** Close the system. See "Opening and Closing the System" on page 38.

# Processors

You can upgrade your processor(s) to take advantage of future options in speed and functionality. Each processor and its associated internal cache memory are contained in a land grid array (LGA) package that is installed in a ZIF socket on the system board.

### Removing a Processor

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

**1** Prior to upgrading your system, download and install the latest system BIOS version on **support.dell.com**.

**2** Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

**3** Open the system. See "Opening and Closing the System" on page 38.

**4** Remove the cooling shroud. See "Removing the Cooling Shroud" on page 39.

⊖ **NOTICE:** When you remove the heat sink, the possibility exists that the processor might adhere to the heat sink and be removed from the socket. It is recommended that you remove the heat sink while the processor is warm.

⊖ **NOTICE:** Never remove the heat sink from a processor unless you intend to remove the processor. The heat sink is necessary to maintain proper thermal conditions.

⊖ **NOTICE:** The processor and heat sink can become extremely hot. Be sure the processor has had sufficient time to cool before handling.

**5** Use a Phillips-head screwdriver to loosen the two retention screws on the heat sink. See Figure 3-9.

**Figure 3-9.    Installing and Removing the Heat Sink**
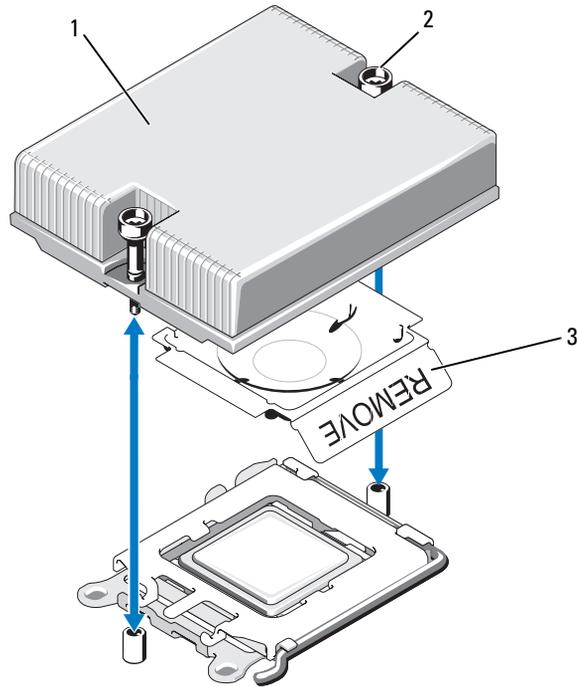


| 1 | heat sink | 2 | heat-sink retention screw (2) | 3 | thermal grease protective cover |

6   Wait 30 seconds for the heat sink to loosen from the processor.

7   If the heat sink has not separated from the processor, carefully rotate the heat sink in a clockwise, then counterclockwise, direction until it releases from the processor. Do not pry the heat sink from the processor.

8   Lift the heat sink off of the processor and set the heat sink on the work surface so it rests on the ends of the retention screws.

9   Use a clean lint-free cloth to remove any thermal grease from the surface of the processor shield.

10  Pull the socket-release lever 90 degrees upward until the processor is released from the socket. See Figure 3-10.

**Figure 3-10. Installing and Removing the Processor**
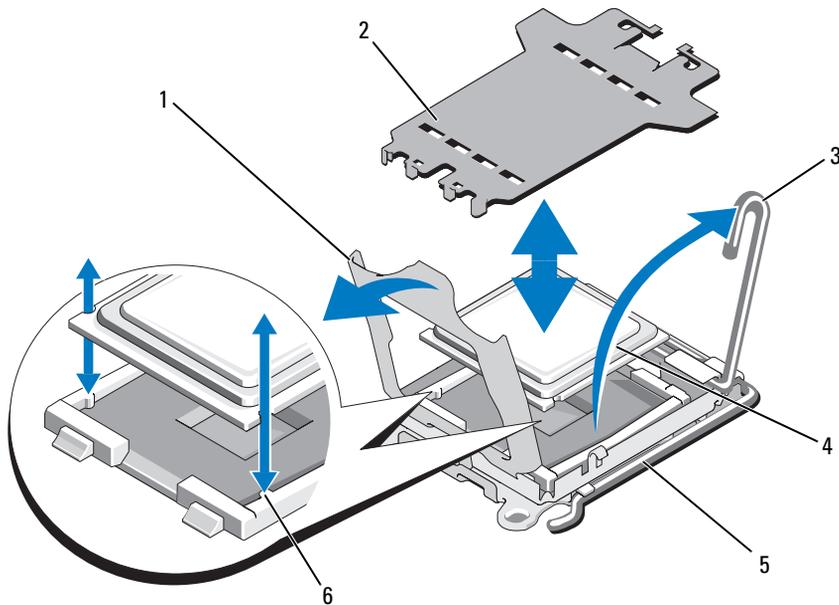


| 1 | processor shield | 2 | socket cover (remove before adding second processor) | 3 | socket-release lever |
|---|---|---|---|---|---|
| 4 | processor | 5 | ZIF socket | 6 | socket key (2) |

**11** Open the processor shield and then lift the processor out of the socket. Leave the release lever up so that the socket is ready for the new processor.

**NOTICE:** Be careful not to bend any of the pins on the LGA socket when removing the processor. Bending the pins can permanently damage the socket and system board.

### Installing a Processor

**1** Unpack the new processor.

**2** Align the processor with the socket keys on the ZIF socket. See Figure 3-10.

**3** If you are adding a second processor to an empty socket, perform the following steps:

    **a** Remove the protective cover from the processor socket. See Figure 3-10.

    **b** Pull the socket-release lever 90 degrees upward. See Figure 3-10.

    **c** Lift the processor shield. See Figure 3-10.

**4** Install the processor in the socket.

�e **NOTICE:** Positioning the processor incorrectly can permanently damage the system board or the processor when you turn the system on.

  **a** If the release lever on the processor socket is not fully open, move it to that position.

  **b** With the processor and the socket keys aligned, set the processor lightly in the socket.

�e **NOTICE:** Do not use force to seat the processor. When the processor is positioned correctly, it fits easily into the socket.

  **c** Close the processor shield. See Figure 3-10.

  **d** Rotate the socket release lever back down until it snaps into place, securing the processor. See Figure 3-10.

**5** Install the heat sink.

  📝 **NOTE:** If you did not receive a replacement heat sink, use the heat sink that you removed in step 8.

  **a** If you receive a heat sink and pre-applied thermal grease with your processor kit, remove the protective sheet from the thermal grease layer on top of the heat sink. See Figure 3-9.

  If you did not receive a replacement heat sink with your processor kit, do the following:

  • Using a clean lint-free cloth, remove the existing thermal grease from the heat sink you removed in step 8.

  • Open the grease packet included with your processor kit and apply thermal grease evenly to the top of the processor.

  **b** Place the heat sink onto the processor. See Figure 3-9.

  **c** Tighten the two heat-sink retention screws. See Figure 3-9.

**6** Close the system. See "Closing the System" on page 39.

As the system boots, it detects the presence of the new processor and automatically changes the system configuration information in the System Setup program.

**7** Press <F2> to enter the System Setup program, and check that the processor information matches the new system configuration.

See "Using the System Setup Program" on page 23 for instructions about using the System Setup program.

**8** Run the system diagnostics to verify that the new processor operates correctly.

See "Running the System Diagnostics" on page 85 for information about running the diagnostics.

# Optical Drive

The optional slimline optical drive is mounted on a tray that slides into the front panel.

✎ **NOTE:** DVD devices are data only.

### Removing the Optical Drive from the System

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

1 Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.

2 If applicable, remove the optional bezel. See "Removing and Replacing the Front Bezel" on page 37.

3 Open the system. See "Opening and Closing the System" on page 38.

4 Disconnect the optical-drive cable from the back of the drive. See Figure 3-11.

5 To remove the optical drive tray, lift the blue tray release tab and slide the drive tray out of the system. See Figure 3-11.

### Installing the Optical Drive in the System

1 Align the optical drive tray with its opening in the front panel.

2 Slide in the drive tray until the release tab snaps into place. See Figure 3-11.

3 Connect the optical-drive cable from the back of the drive. See Figure 3-11.

4 Close the system. See "Opening and Closing the System" on page 38.

5 If applicable, replace the bezel. See "Removing and Replacing the Front Bezel" on page 37.

6 Reconnect your system and peripherals to their electrical outlets, and turn on the system.

**Figure 3-11. Removing and Installing the Optical Drive**
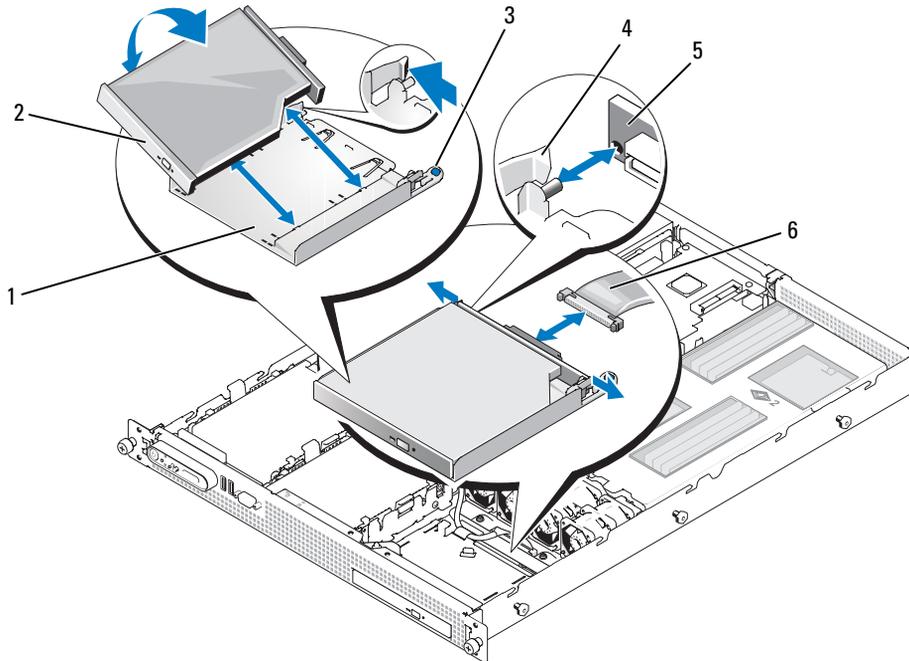


| 1 | drive tray | 2 | optical drive | 3 | tray release tab |
|---|---|---|---|---|---|
| 4 | interposer board retention tabs (2) | 5 | interposer board | 6 | optical-drive cable |

### Removing the Optical Drive from the Drive Tray

1 Remove the interposer board from the drive by deflecting the tab at each end of the board.

2 To remove the drive from the tray, push outward on the left retention tab at the back of the tray so as to bend the tray wall out slightly and then pull up on the left side of the drive to disengage.

To install a new drive in the tray, fit the drive into the tray, then fit the interposer board onto the back of the drive.

## Hard Drives

This subsection describes how to install and configure SAS or SATA hard drives in the system's two internal hard-drive bays.

## Optional SAS RAID Controller

If you install the optional SAS RAID controller card, you can install two SAS or SATA hard drives and configure them for RAID 0 or RAID 1 operation.

- See "Expansion Cards" on page 44 for information on installing the optional SAS RAID controller card.
- See the RAID controller card documentation for information about the RAID configuration utility.

## Before You Begin

You may need to use different programs than those provided with the operating system to partition and format SAS or SATA hard drives.

**NOTICE:** Do not turn off or reboot your system while the drive is being formatted. Doing so can cause a drive failure.

When you format a high-capacity hard drive, allow enough time for the formatting to be completed. Long format times for these drives are normal.

## Installing a Hard Drive

1 If you are replacing an existing hard drive, disconnect the data and power cables from the back of the drive. See Figure 3-12.

2 To remove the drive carrier from the system, press inwards on the release tabs on each side of the carrier and lift the carrier from the system. See Figure 3-12.

3 If you are replacing an existing hard drive, deflect the sides of the carrier outward and separate the hard drive from the carrier.

4 To install the new hard drive in the carrier, fit the left edge of the drive into the carrier, then lower the right edge of the drive into the carrier until the pins fit into the corresponding holes in the drive. See Figure 3-12.

5 Reinstall the drive carrier into the system.

6 Connect the data cable to the back of the drive.

7 Connect the other end of the cable to the drive controller:

- If you are connecting the drive to the optional SAS controller card, route the SAS data cable though the oval opening in the chassis brace and connect the cable to the data connector on the controller card. Secure the data cable to the clips on the edge of the cooling shroud.

- If you are connecting the drive to the SATA controller on the system board, route the SATA data cable though the oval opening in the chassis brace and connect the cable to SATA connector SATA A or SATA B. See Figure 6-2.

8 Connect the power cable to the back of the drive. See Figure 3-12.

**Figure 3-12. Installing a Hard-Drive**
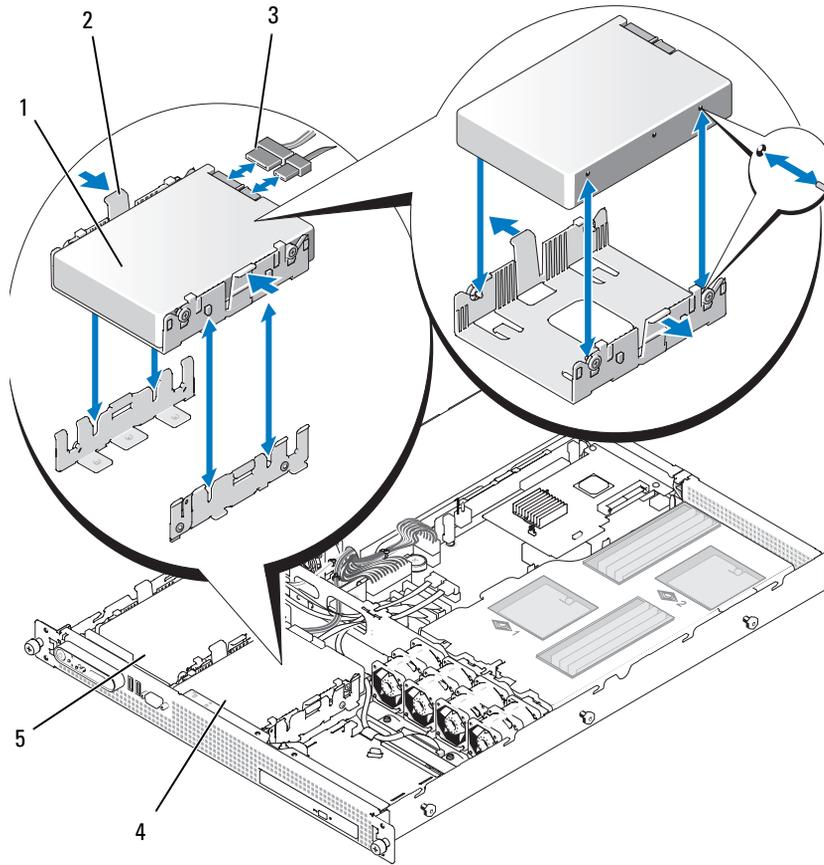


| | | | | | |
|---|---|---|---|---|---|
| 1 | hard drive | 2 | drive carrier release tabs (2) | 3 | drive power and data cables |
| 4 | hard drive bay 1 | 5 | hard drive bay 0 | | | |

# Configuring the Boot Device

If you plan to boot the system from a hard drive, the drive must be attached to the primary (or boot) controller. The device that the system boots from is determined by the boot order specified in the System Setup program.

The System Setup program provides options that the system uses to scan for installed boot devices. See "Using the System Setup Program" on page 23 for information about the System Setup program.

# Expansion-Card Riser

## Removing an Expansion-Card Riser

⚠️ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

2 Open the system. See "Opening and Closing the System" on page 38.

3 If applicable, remove the expansion card from the riser.

4 Press the release latch on the riser board and lift the riser board straight up from the system board. See Figure 3-13.

**Figure 3-13.   Expansion-Card Riser Removal**



| 1 | riser board | 2 | riser board release latch | 3 | riser board connector on system board |
|---|---|---|---|---|---|
| 4 | riser board alignment pins (2) | | | | |

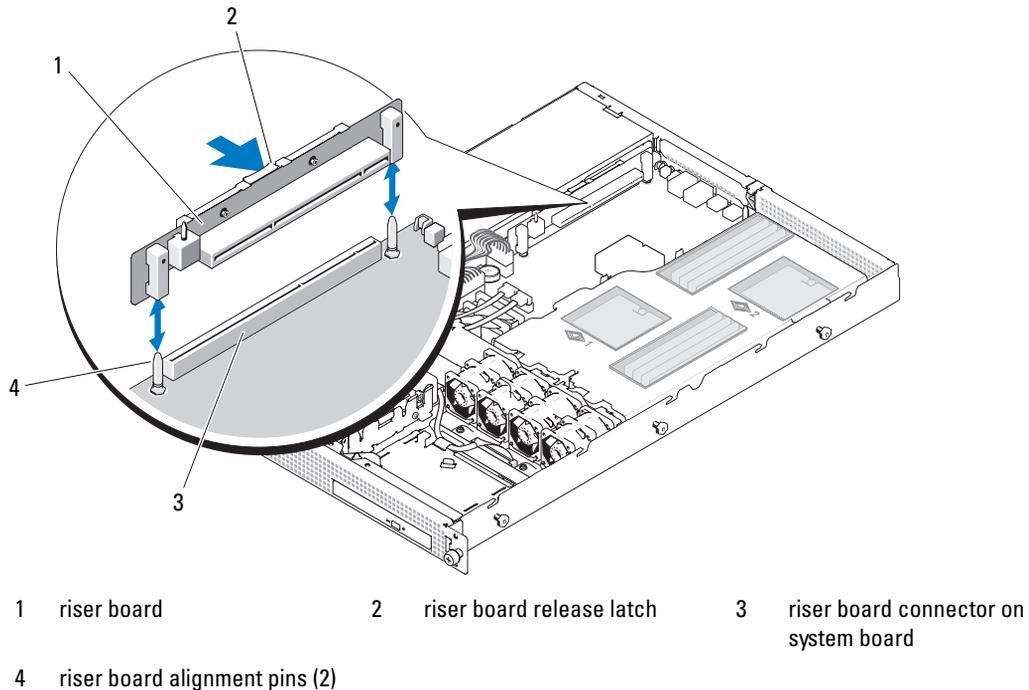### Installing an Expansion-Card Riser

⚠️ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

1  Align the riser board with the two alignment pins on the system board, then lower the board onto the pins. See Figure 3-13.

2  Press down on the riser board until the edge connector on the board is fully seated in the riser board connector on the system board.

3  If applicable, install the expansion card in the expansion-card slot.

4  Close the system. See "Opening and Closing the System" on page 38.

5  Reconnect your system and peripherals to their electrical outlets, and turn on the system.

# System Battery

The system battery is a 3.0-volt (V), coin-cell battery.

### Replacing the System Battery

⚠️ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

⚠️ **CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. See your *System Information Guide* for additional information.**

1  Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2  Open the system. See "Opening and Closing the System" on page 38.

3  To improve access to the battery, disconnect the power cable from the POWER1 connector on the system board. See Figure 3-6.

4  Locate the battery socket. See Figure 6-2.

⊘ **NOTICE:** If you pry the battery out of its socket with a blunt object, be careful not to touch the system board with the object. Ensure that the object is inserted between the battery and the socket before you attempt to pry out the battery. Otherwise, you may damage the system board by prying off the socket or by breaking circuit traces on the system board.

⊘ **NOTICE:** To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.

**5** Remove the system battery.

    **a** Support the battery connector by pressing down firmly on the positive side of the connector.

    **b** While supporting the battery connector, press the battery toward the positive side of the connector and pry it up out of the securing tabs at the negative side of the connector.

**Figure 3-14. Replacing the System Battery**
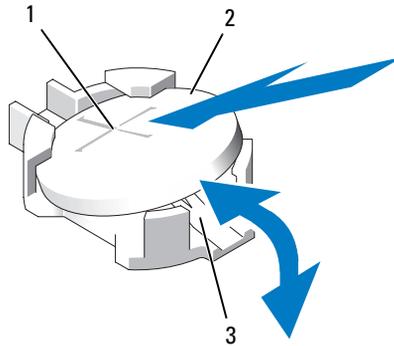


| 1 | positive side of battery connector | 2 | system battery | 3 | negative side of battery connector |
|---|---|---|---|---|---|

⊘ **NOTICE:** To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.

**6** Install the new system battery.

    **a** Support the battery connector by pressing down firmly on the positive side of the connector.

    **b** Hold the battery with the "+" facing up, and slide it under the securing tabs at the positive side of the connector.

    **c** Press the battery straight down into the connector until it snaps into place.

**7** If you disconnected the power cable from connector POWER1 in step 3, reconnect the power cable now.

**8** Close the system. See "Opening and Closing the System" on page 38.

**9** Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

**10** Enter the System Setup program to confirm that the battery is operating properly. See "Using the System Setup Program" on page 23.

**11** Enter the correct time and date in the System Setup program's **Time** and **Date** fields.

**12** Exit the System Setup program.

**13** To test the newly installed battery, turn off the system and disconnect it from the electrical outlet for at least an hour.

**14** After an hour, reconnect the system to its electrical outlet and turn it on.

**15** Enter the System Setup program and if the time and date are still incorrect, see "Getting Help" on page 95 for instructions on obtaining technical assistance.

# Control Panel Assembly (Service-Only Procedure)

## Removing the Control Panel

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

**1** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

**2** Open the system. See "Opening and Closing the System" on page 38.

**3** Disconnect the control panel cable from the control panel board. See Figure 3-15.

🚫 **NOTICE:** Do not pull on the cable to unseat the connector. Doing so can damage the cable.

   **a** Squeeze the metal tabs on the ends of the cable connector.

   **b** Gently work the connector out of the socket.

**4** Remove the two screws securing the control panel board, and remove the board. See Figure 3-15.

**Figure 3-15. Control Panel Removal and Installation**



| 1 | control panel cable | 2 | control-panel circuit board securing screws (2) | 3 | control panel circuit board |
|---|---|---|---|---|---|
| 4 | tabs (3) | | | | |

## Installing the Control Panel

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

5 Place the new control panel board in the system and secure it with the two Phillips screws. See Figure 3-15.

   The front edge of the board fits under the three L-shaped tabs on the chassis.

6 Connect the control panel cable to the control panel board.

7 Close the system. See "Opening and Closing the System" on page 38.

8 Reconnect the system to the power source and turn on the system and attached peripherals.

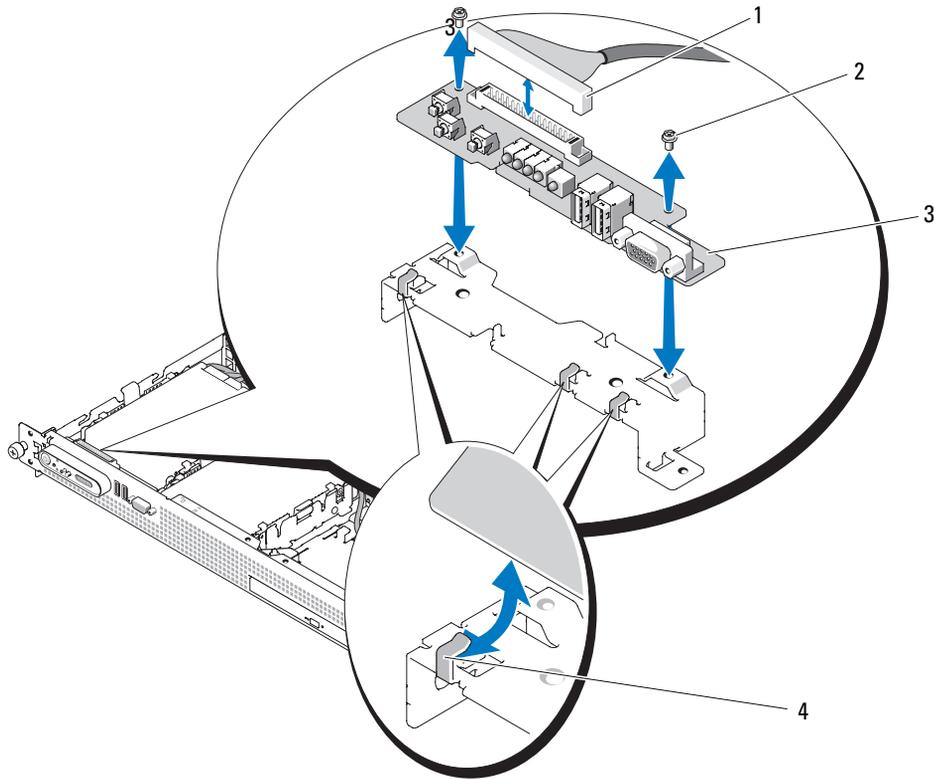# System Board (Service-Only Procedure)

## Removing the System Board

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.**

1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

2 Open the system. See "Opening and Closing the System" on page 38.

3 Disconnect any cables from the system board back panel.

4 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 39.

5 Remove the expansion-card riser from the system board. See "Removing an Expansion-Card Riser" on page 58.

6 Disconnect the two fan module power cables from the system board. See Figure 3-5.

7 Remove the power supply. See "Removing the Power Supply" on page 42.

8 If applicable, disconnect the optical drive cable from the system board. See Figure 6-2.

⊘ **NOTICE:** Do not pull on the cable to unseat the connector. Doing so can damage the cable.

   a Squeeze the metal tabs on the ends of the cable connector.

   b Gently work the connector out of the socket.

9 Disconnect the control panel cable from the system board. See Figure 6-2.

⊘ **NOTICE:** Do not pull on the cable to unseat the connector. Doing so can damage the cable.

   a Squeeze the metal tabs on the ends of the cable connector.

   b Gently work the connector out of the socket.

10 Remove the system board:

   a Pull the system-board release pin. See Figure 3-16.

   b While pulling the release pin, slide the system-board tray toward the front of the chassis.

   c Lift up the system-board tray and remove it from the chassis.

⚠ **CAUTION: The memory modules and processor heat sink are hot to the touch for some time after the system has been powered down. Allow time for these components to cool before handling them. Handle the memory modules by the card edges and avoid touching the components on the memory module.**

   ✎ **NOTE:** While removing the memory modules, record the memory module socket locations to ensure proper installation.

11 Remove the memory modules. See "Removing Memory Modules" on page 49.

12 Remove the heatsink(s) and microprocessor(s). See "Removing a Processor" on page 50.

**Figure 3-16. System Board Removal**
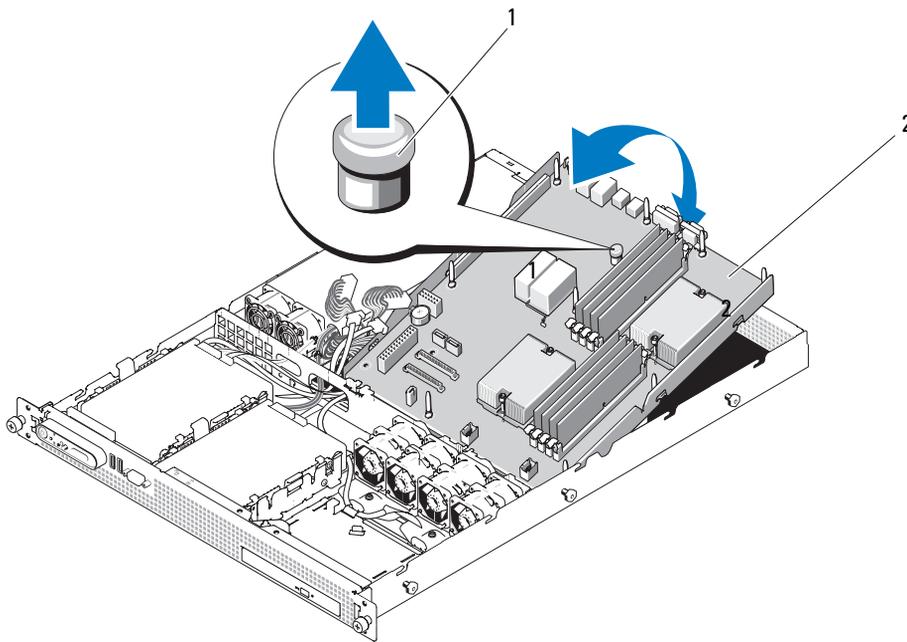


| 1 | system board release pin | 2 | system board attached to system-board tray |
|---|---|---|---|

## Installing a System Board

1. Install the heatsink(s) and microprocessor(s). See "Installing a Processor" on page 52

2. Install the memory modules in their original locations. See "Installing Memory Modules" on page 48.

3. Lower the system-board tray into the system until the tray sits flat on the bottom of the chassis.

4. Slide the system-board tray toward the back of the chassis until the system board release pin locks into position.

5. Connect the control panel cable to the system board. See Figure 6-2.

6. If applicable, connect the optical drive cable to the system board. See Figure 6-2.

7. Reinstall the power supply. See "Installing the Power Supply" on page 43.

8. Replace the riser board. See "Installing an Expansion-Card Riser" on page 59.

9. Replace any expansion card(s). See "Installing an Expansion Card" on page 44.

10. Reconnect the two fan module power cables to the system board. See "Removing and Installing a Cooling Fan Module" on page 41.

11. Replace the cooling shroud. See "Replacing the Cooling Shroud" on page 40.

**12** Close the system. See "Opening and Closing the System" on page 38.

**13** Connect the external cables to the system.

**14** Reconnect the system to the power source and turn on the system and attached peripherals.

# 4

# Troubleshooting Your System

## Safety First—For You and Your System

To perform certain procedures in this document, you must remove the system cover and work inside the system. While working inside the system, do not attempt to service the system except as explained in this guide and elsewhere in your system documentation.

> ⚠️ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

## Start-Up Routine

Look and listen during the system's start-up routine for the indications described in Table 1-1.

**Table 4-1.  Start-Up Routine Indications**

| Look/listen for: | Action |
|---|---|
| A status code displayed by the diagnostic indicator lights on the system front panel. | See "Diagnostics Indicator Codes" on page 14. |
| An error message displayed on the monitor. | See "System Messages" on page 16. |
| Alert messages from the systems management software. | See the systems management software documentation. |
| The monitor's power indicator. | See "Troubleshooting the Video Subsystem" on page 69. |
| The keyboard indicators. | See "Troubleshooting the Keyboard" on page 70. |
| The USB CD drive activity indicator. | See "Troubleshooting a USB Device" on page 71. |
| The CD drive activity indicator. | See "Troubleshooting an Optical Drive" on page 78. |
| The hard-drive activity indicator. | See "Troubleshooting a Hard Drive" on page 78. |
| An unfamiliar constant scraping or grinding sound when you access a drive. | See "Getting Help" on page 95. |

# Checking Basic Power Problems

1   If the power indicator on the system front panel or power supply does not indicate that power is available to the system, ensure that the power cable is securely connected to the power supply.

2   If the system is connected to a PDU or UPS, turn the PDU or UPS off and then on.

3   If the PDU or UPS is not receiving power, plug it into another electrical outlet. If it still is not receiving power, try another PDU or UPS.

4   Reconnect the system to the electrical outlet and turn on the system.

5   If the system still is not working properly, see "Troubleshooting the Power Supply" on page 74.

# Checking the Equipment

This section provides troubleshooting procedures for external devices attached to the system, such as the monitor, keyboard, or mouse. Before you perform any of the procedures, see "Troubleshooting External Connections" on page 69.

### Troubleshooting IRQ Assignment Conflicts

Most PCI devices can share an IRQ with another device, but they cannot use an IRQ simultaneously. To avoid this type of conflict, see the documentation for each PCI device for specific IRQ requirements. Table 4-2 lists the IRQ assignments.

**Table 4-2.   IRQ Assignment Defaults**

| IRQ Line | Assignment |
| --- | --- |
| IRQ0 | System timer |
| IRQ1 | Keyboard controller |
| IRQ2 | Interrupt controller 1 to enable IRQ8 through IRQ15 |
| IRQ3 | *Available* |
| IRQ4 | Serial port 1 (COM1 and COM3) |
| IRQ5 | *Available* |
| IRQ6 | Reserved |
| IRQ7 | Reserved |
| IRQ8 | Real-time clock |
| IRQ9 | ACPI functions (used for power management) |
| IRQ10 | *Available* |
| IRQ11 | *Available* |
| IRQ12 | *Available* |

Table 4-2.   IRQ Assignment Defaults *(continued)*

| IRQ Line | Assignment |
| --- | --- |
| IRQ13 | Math coprocessor |
| IRQ14 | IDE CD drive controller |
| IRQ15 | *Available* |

## Troubleshooting External Connections

Loose or improperly connected cables are the most likely source of problems for the system, monitor, and other peripherals (such as a printer, keyboard, mouse, or other external device). Ensure that all external cables are securely attached to the external connectors on your system. See "Front-Panel Features and Indicators" on page 11 and "Back-Panel Features and Indicators" on page 13 for the front- and back-panel connectors on your system.

## Troubleshooting the Video Subsystem

### Problem

- Monitor is not working properly.
- Video memory is faulty.

### Action

1  Check the system and power connections to the monitor.

2  Determine whether the system has an expansion card with a video output connector.

   In this system configuration, the monitor cable should normally be connected to the connector on the expansion card, *not* to the system's integrated video connector.

   To verify that the monitor is connected to the correct video connector, turn off the system and wait for 1 minute, then connect the monitor to the other video connector and turn the system on again.

3  Determine whether the system has monitors attached to both the front and rear video connectors.

   The system supports only one monitor attached to either the front or rear video connector. When a monitor is connected to the front panel, the back-panel video connector is disabled.

   If two monitors are attached to the system, disconnect one monitor. If the problem is not resolved, continue to the next step.

4  Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

   If the tests run successfully, the problem is not related to video hardware.

   If the tests fail, see "Getting Help" on page 95.

### Troubleshooting the Keyboard

*Problem*

- System message indicates a problem with the keyboard
- Keyboard is not functioning properly

*Action*

1 Enter the System Setup program and ensure that the USB ports are enabled. See "Using the System Setup Program" on page 23.

2 Examine the keyboard and its cable for signs of damage.

3 Swap the faulty keyboard with a working keyboard.

 If the problem is resolved, replace the faulty keyboard. See "Getting Help" on page 95.

4 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

 If the problem is not resolved, see "Getting Help" on page 95.

### Troubleshooting the Mouse

*Problem*

- System message indicates a problem with the mouse.
- Mouse is not functioning properly.

*Action*

1 Enter the System Setup program and ensure that the USB ports are enabled. See "Using the System Setup Program" on page 23.

2 Examine the mouse and its cable for signs of damage.

3 Swap the faulty mouse with a working mouse.

 If the problem is resolved, replace the faulty mouse. See "Getting Help" on page 95.

4 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

 If the test fails, see "Getting Help" on page 95.

## Troubleshooting Basic I/O Functions

*Problem*

- Error message indicates a problem with a serial port.
- Device connected to a serial port is not operating properly.

*Action*

1 Enter the System Setup program and ensure that the serial port is enabled, and the serial port/COM ports are configured appropriately for any applications you are using. See "Using the System Setup Program" on page 23.

2 If the problem is confined to a particular application, see the application documentation for specific port configuration requirements that the program may require.

3 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

If the tests run successfully but the problem persists, see "Troubleshooting a Serial I/O Device" on page 71.

## Troubleshooting a Serial I/O Device

*Problem*

• Device connected to the serial port is not operating properly.

*Action*

1 Turn off the system and any peripheral devices connected to the serial port.

2 Swap the serial interface cable with a working cable, and turn on the system and the serial device.

If the problem is resolved, replace the interface cable.

3 Turn off the system and the serial device, and swap the device with a comparable device.

4 Turn on the system and the serial device.

If the problem is resolved, replace the serial device. See "Getting Help" on page 95.

If the problem persists, see "Getting Help" on page 95.

## Troubleshooting a USB Device

*Problem*

• System message indicates a problem with a USB device.

• Device connected to a USB port is not operating properly.

*Action*

1 Enter the System Setup program, and ensure that the USB ports are enabled. See "Using the System Setup Program" on page 23.

2 Turn off the system and any USB devices.

3 Disconnect the USB devices, and connect the malfunctioning device to the other USB connector.

4 Turn on the system and the reconnected device.

If the problem is resolved, the USB connector might be defective. See "Getting Help" on page 95.

**5** If possible, swap the interface cable with a working cable.

If the problem is resolved, replace the interface cable. See "Getting Help" on page 95.

**6** Turn off the system and the USB device, and swap the device with a comparable device.

**7** Turn on the system and the USB device.

If the problem is resolved, replace the USB device. See "Getting Help" on page 95.

If the problem persists, see "Getting Help" on page 95.

# Troubleshooting a NIC

### Problem

- NIC cannot communicate with network.

### Action

**1** Run the appropriate online diagnostic test. See "Running the System Diagnostics" on page 85.

**2** Check the appropriate indicator on the NIC connector. See "NIC Indicator Codes" on page 14.

- If the link indicator does not light, check all cable connections.

- If the activity indicator does not light, the network driver files might be damaged or missing.

Remove and reinstall the drivers if applicable. See the NIC documentation.

- Change the autonegotiation setting, if possible.

- Use another connector on the switch or hub.

If you are using a NIC card instead of an integrated NIC, see the documentation for the NIC card.

**3** Ensure that the appropriate drivers are installed and the protocols are bound. See the NIC documentation.

**4** Enter the System Setup program and confirm that the NICs are enabled. See "Using the System Setup Program" on page 23.

**5** Ensure that the NICs, hubs, and switches on the network are all set to the same data transmission speed. See the network equipment documentation.

**6** Ensure that all network cables are of the proper type and do not exceed the maximum length. See Network Cable Requirements in your *Getting Started Guide*.

# Troubleshooting a Wet System

### Problem

- Liquid spilled on the system.
- Excessive humidity.

*Action*

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

1  Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

2  Open the system. See "Opening and Closing the System" on page 38.

3  Remove any expansion card installed in the system. See "Removing an Expansion Card" on page 45.

4  Let the system dry thoroughly for at least 24 hours.

5  Close the system. See "Opening and Closing the System" on page 38.

6  Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

   If the system does not start properly, see "Getting Help" on page 95.

7  If the system starts properly, shut down the system and reinstall any expansion card that you removed. See "Installing an Expansion Card" on page 44.

8  Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

   If the tests fail, see "Getting Help" on page 95.

## Troubleshooting a Damaged System

*Problem*

•  System was dropped or damaged.

*Action*

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

1  Open the system. See "Opening and Closing the System" on page 38.

2  Ensure that the following components are properly installed:

   •  Cooling shroud

   •  Expansion card and riser

   •  Processor(s) and heatsink(s)

   •  Memory modules

   •  Fans

3  Ensure that all cables are properly connected.

4  Close the system. See "Opening and Closing the System" on page 38.

**5** Run the system board tests in the system diagnostics. See "Running the System Diagnostics" on page 86.

If the tests fail, see "Getting Help" on page 95.

# Troubleshooting the System Battery

*Problem*

- System message indicates a problem with the battery.
- System Setup program loses system configuration information.
- System date and time do not remain current.

 **NOTE:** If the system is turned off for long periods of time (for weeks or months), the NVRAM may lose its system configuration information. This situation is caused by a defective battery.

*Action*

**1** Re-enter the time and date through the System Setup program. See "Using the System Setup Program" on page 23.

**2** Turn off the system and disconnect it from the electrical outlet for at least one hour.

**3** Reconnect the system to the electrical outlet and turn on the system.

**4** Enter the System Setup program.

If the date and time are not correct in the System Setup program, replace the battery. See "System Battery" on page 59.

If the problem is not resolved by replacing the battery, see "Getting Help" on page 95.

 **NOTE:** Some software may cause the system time to speed up or slow down. If the system seems to operate normally except for the time kept in the System Setup program, the problem may be caused by software rather than by a defective battery.

# Troubleshooting the Power Supply

*Problem*

- Power button indicator is off.

*Action*

**1** Ensure that the power supply is properly installed by reconnecting the power cables to the system board. See "Installing the Power Supply" on page 43.

If the problem persists, continue to the next step.

**2** Replace the faulty power supply with a new power supply. See "Power Supply" on page 42.

If the problem is not resolved, see ""Getting Help" on page 95."

### Problem

- Power button is not blinking green and the system does not power up.

### Action

**1** Ensure that the power cable is properly connected between the power supply and electrical outlet.

**2** If you have a UPS, make sure that it is connected properly both to the power supply and to the electrical outlet.

**3** Ensure that the power supply is properly installed by reconnecting the power cables to the system board. See "Installing the Power Supply" on page 43.

**4** Replace the power supply with a new power supply. See "Power Supply" on page 42.

**5** If the problem persists, see ""Getting Help" on page 95."

# Troubleshooting System Cooling Problems

### Problem

- Systems management software issues a fan-related error message.

### Action

Ensure that none of the following conditions exist:

- System cover or cooling shroud is removed.
- Ambient temperature is too high.
- External airflow is obstructed.
- Cables inside the system obstruct airflow.
- A cooling fan has failed. See "Troubleshooting a Fan" on page 75.

## Troubleshooting a Fan

### Problem

- System-status indicator is amber.
- Systems management software issues a fan-related error message.

*Action*

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

1 Run the appropriate diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

3 Open the system. See "Opening and Closing the System" on page 38.

4 Locate the faulty fan module indicated by the diagnostic software. For the identification number of each fan, see "Removing and Installing a Cooling Fan Module" on page 41.

5 Ensure that the faulty fan module's power cable is firmly attached to the fan power connector on the system board. See "Cooling Fan Modules" on page 40.

6 If the problem is not resolved, install a new fan module. See "Cooling Fan Modules" on page 40.

7 Close the system. See "Opening and Closing the System" on page 38.

8 Run the appropriate diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

If the replacement fan module does not operate, see "Getting Help" on page 95.

# Troubleshooting System Memory

*Problem*

- Faulty memory module.
- Faulty system board.
- Diagnostic indicator code indicates a problem with system memory.

*Action*

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

1 If the system is operational, run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

If diagnostics indicates a fault, follow the corrective action(s) provided by the diagnostic program. If the problem is not resolved or if the system is not operational, proceed to step 2.

2 Turn off the system and attached peripherals, unplug the system from the power source and press the power button, and reconnect the system to power.

**3** Turn on the system and attached peripherals and, as the system boots, note the messages on the screen.

If the amount of system memory detected during POST does not match the amount of memory installed, proceed to the next step.

If an error message appears, go to step 12.

**4** Enter the System Setup program and check the system memory setting. See "Using the System Setup Program" on page 23.

If the amount of memory installed matches the system memory setting, go to step 12.

**5** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

**6** Open the system. See "Opening and Closing the System" on page 38.

**7** Ensure that the memory banks are populated correctly. See "Memory Module Installation Guidelines" on page 46.

If the memory modules are populated correctly, continue to the next step.

**8** Reseat the memory modules in their sockets. See "Installing Memory Modules" on page 48.

**9** Close the system. See "Opening and Closing the System" on page 38.

**10** Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.

**11** Enter the System Setup program and check the system memory setting. See "Using the System Setup Program" on page 23. If the amount of memory installed still does not match the system memory setting, proceed to the next step.

**12** Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.

**13** Open the system. See "Opening and Closing the System" on page 38.

**14** If a diagnostic test or error message indicates a specific memory module as faulty, swap or replace the module. Otherwise, swap the memory module in socket 1 with a module of the same type and capacity that is known to be good. See "Installing Memory Modules" on page 48.

**15** Close the system. See "Opening and Closing the System" on page 38.

**16** Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.

**17** As the system boots, observe any error message that appears and the diagnostic indicators on the front of the system.

**18** If the memory problem is still indicated, repeat step 12 through step 17 for each memory module installed until the faulty memory module is replaced.

If the problem persists after all memory modules have been checked, see "Getting Help" on page 95.

# Troubleshooting an Optical Drive

### Problem

- System cannot read data from a CD or DVD in an optical drive.
- Optical drive indicator does not blink during boot.

**NOTE:** DVD devices are data only.

### Action

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

1   Try using a different CD or DVD that you know works properly.

2   Enter the System Setup program and ensure that the drive's IDE controller is enabled. See "Using the System Setup Program" on page 23.

3   Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

4   Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

5   Open the system. See "Opening and Closing the System" on page 38.

6   Ensure that the interface cable is securely connected to the optical drive.

7   Close the system. See "Opening and Closing the System" on page 38.

8   Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

    If the problem is not resolved, see "Getting Help" on page 95.

# Troubleshooting a Hard Drive

### Problem

- Device driver error.
- One or more hard drives not recognized by the system.

### Action

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

**NOTICE:** This troubleshooting procedure can destroy data stored on the hard drive. Before you proceed, back up all files on the hard drive.

1 Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

   Depending on the results of the diagnostics test, proceed as needed through the following steps.

2 If your system has a SAS RAID controller card, perform the following steps.

   **a** Restart the system and press <Ctrl><C> to enter the RAID configuration utility program.

   See the documentation supplied with the RAID controller for information about the configuration utility.

   **b** Ensure that the hard drive has been configured correctly for the RAID controller.

   **c** Exit the configuration utility and allow the system to boot to the operating system.

3 If your system has a SAS controller card, ensure that the required device drivers are installed and are configured correctly. See the operating system documentation for more information.

4 Check the cable connections inside the system:

   **a** Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

   **b** Open the system. See "Opening and Closing the System" on page 38.

   **c** Verify that the cable connections between the hard drive(s) and the drive controller are correct, whether the connections are to the SATA connectors on the system board (see Figure 6-2) or a SAS expansion card.

   **d** Verify that the drive cables are seated in their connectors.

   **e** Close the system. See "Opening and Closing the System" on page 38.

   **f** Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

   If the problem persists, see "Getting Help" on page 95.

## Troubleshooting a SAS RAID Controller Card

**NOTE:** When troubleshooting a SAS RAID controller card, also see the documentation for your operating system and the controller card.

*Problem*

- Error message indicates a problem with the SAS RAID controller card.
- SAS RAID controller card performs incorrectly or not at all.

*Action*

⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

1   Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

2   Enter the System Setup program and ensure that the SAS RAID controller card is enabled and drivers are loaded. See "Using the System Setup Program" on page 23.

3   Restart the system and press <Ctrl><C> to enter the SAS RAID controller configuration utility program.

    See the controller's documentation for information about configuration settings.

4   Check the configuration settings, make any necessary corrections, and restart the system.

    If the problem is not resolved, continue to the next step.

5   Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.

6   Open the system. See "Opening and Closing the System" on page 38.

7   Ensure that the controller card is firmly seated in its connector. See "Expansion Cards" on page 44.

8   If you have a SAS RAID controller card, ensure that the memory module is properly installed.

9   Verify that the cable connections between the drives and the SAS controller card are correct. See "Installing a Hard Drive" on page 56.

10  Close the system. See "Opening and Closing the System" on page 38.

11  Reconnect the system to its electrical outlet, and turn on the system and attached peripherals. If the problem persists, see "Getting Help" on page 95.

# Troubleshooting an Expansion Card

✍ **NOTE:** When troubleshooting an expansion card, see the documentation for your operating system and the expansion card.

*Problem*

• Error message indicates a problem with an expansion card.

• Expansion card performs incorrectly or not at all.

*Action*

⚠️ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

1   Run the appropriate online diagnostic test. See "Using Dell PowerEdge Diagnostics" on page 85.

2   Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

3   Open the system. See "Opening and Closing the System" on page 38.

4   Ensure that the riser board and expansion card are firmly seated in their connectors. See "Installing an Expansion Card" on page 44 and "Expansion-Card Riser" on page 58.

5   Close the system. See "Opening and Closing the System" on page 38.

6   Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

    If the problem persists, go to the next step.

7   Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

8   Open the system. See "Opening and Closing the System" on page 38.

9   Remove the expansion card.

10   Close the system. See "Opening and Closing the System" on page 38.

11   Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

12   Run the appropriate online diagnostic test.

    If the tests fail, see "Getting Help" on page 95.

13   Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

14   Open the system. See "Opening and Closing the System" on page 38.

15   Reinstall the expansion card.

16   Close the system. See "Opening and Closing the System" on page 38.

17   Run the appropriate diagnostic test.

    If the tests fail, see "Getting Help" on page 95.

# Troubleshooting the Microprocessors

## *Problem*

- Error message indicates a processor problem.
- A heat sink is not installed for each processor.

## *Action*

> ⚠ **CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see your *Product Information Guide* for complete information about safety precautions, working inside the computer and protecting against electrostatic discharge.**

1   If possible, run the appropriate online diagnostics test. See "Using Dell PowerEdge Diagnostics" on page 85.

2   Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

3   Open the system. See "Opening and Closing the System" on page 38.

4   Ensure that each processor and heat sink are properly installed. See "Removing a Processor" on page 50.

5   Close the system. See "Opening and Closing the System" on page 38.

6   Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

7   Run the appropriate online diagnostic test.

    If the tests fail or the problem persists, continue to the next step.

8   Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

9   Open the system. See "Opening and Closing the System" on page 38.

10  Remove processor 2, leaving only processor 1 installed. See "Removing a Processor" on page 50.

    If only one processor is installed, see "Getting Help" on page 95.

11  Close the system. See "Opening and Closing the System" on page 38.

12  Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

13  Run the appropriate online diagnostic test.

    If the tests complete successfully, go to step 19.

14  Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

15  Open the system. See "Opening and Closing the System" on page 38.

16  Replace processor 1 with another processor of the same capacity. See "Removing a Processor" on page 50.

17  Close the system. See "Opening and Closing the System" on page 38.

**18** Run the appropriate online diagnostic test.

If the tests complete successfully, replace processor 1. See "Getting Help" on page 95.

**19** Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

**20** Open the system. See "Opening and Closing the System" on page 38.

**21** Reinstall the processor that you removed in step 10. See "Removing a Processor" on page 50.

**22** Close the system. See "Opening and Closing the System" on page 38.

**23** Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem persists, see "Getting Help" on page 95.

# 5

# Running the System Diagnostics

If you experience a problem with your system, run the diagnostics before calling for technical assistance. The purpose of the diagnostics is to test your system's hardware without requiring additional equipment or risking data loss. If you are unable to fix the problem yourself, service and support personnel can use diagnostics test results to help you solve the problem.

## Using Dell PowerEdge Diagnostics

To assess a system problem, first use the online Dell™ PowerEdge™ Diagnostics. Dell PowerEdge Diagnostics is a suite of diagnostic programs, or test modules, that include diagnostic tests on chassis and storage components such as hard drives, physical memory, communications and printer ports, NICs, CMOS, and more. If you are unable to identify the problem using the PowerEdge Diagnostics, then use the system diagnostics.

The files required to run PowerEdge Diagnostics for systems running supported Microsoft® Windows® and Linux operating systems are available at **support.dell.com** and on the CDs that came with your system. For information about using diagnostics, see the *Dell PowerEdge Diagnostics User's Guide*.

## System Diagnostics Features

The system diagnostics provides a series of menus and options for particular device groups or devices. The system diagnostics menus and options allow you to:

- Run tests individually or collectively.
- Control the sequence of tests.
- Repeat tests.
- Display, print, or save test results.
- Temporarily suspend testing if an error is detected or terminate testing when a user-defined error limit is reached.
- View help messages that briefly describe each test and its parameters.
- View status messages that inform you if tests are completed successfully.
- View error messages that inform you of problems encountered during testing.

# When to Use the System Diagnostics

If a major component or device in the system does not operate properly, component failure may be indicated. As long as the microprocessor and the system's input/output devices (monitor, keyboard, and diskette drive) are functioning, you can use the system diagnostics to help identify the problem.

# Running the System Diagnostics

The system diagnostics is run from the utility partition on your hard drive.

**NOTICE:** Use the system diagnostics to test only your system. Using this program with other systems may cause invalid results or error messages. In addition, use only the program that came with your system (or an updated version of that program).

1  As the system boots, press <F10> during POST.

2  From the utility partition main menu, select **Run System Diagnostics**, or select **Run Memory Diagnostics** if you are troubleshooting memory.

When you start the system diagnostics, a message is displayed stating that the diagnostics are initializing. Next, the **Diagnostics** menu appears. The menu allows you to run all or specific diagnostics tests or to exit the system diagnostics.

**NOTE:** Before you read the rest of this section, start the system diagnostics so that you can see the utility on your screen.

# System Diagnostics Testing Options

Click the testing option in the **Main Menu** window. Table 5-1 provides a brief explanation of testing options.

**Table 5-1.    System Diagnostics Testing Options**

| Testing Option | Function |
| --- | --- |
| Express Test | Performs a quick check of the system. This option runs device tests that do not require user interaction. Use this option to quickly identify the source of your problem. |
| Extended Test | Performs a more thorough check of the system. This test can take an hour or longer. |
| Custom Test | Tests a particular device. |
| Information | Displays test results. |

# Using the Custom Test Options

When you select **Custom Test** in the **Main Menu** window, the **Customize** window appears and allows you to select the device(s) to be tested, select specific options for testing, and view the test results.

## Selecting Devices for Testing

The left side of the **Customize** window lists devices that can be tested. Devices are grouped by device type or by module, depending on the option you select. Click the **(+)** next to a device or module to view its components. Click **(+)** on any component to view the tests that are available. Clicking a device, rather than its components, selects all of the components of the device for testing.

## Selecting Diagnostics Options

Use the **Diagnostics Options** area to select how you want to test a device. You can set the following options:

- **Non-Interactive Tests Only** — When checked, runs only tests that require no user intervention.
- **Quick Tests Only** — When checked, runs only the quick tests on the device. Extended tests will not run when you select this option.
- **Show Ending Timestamp** — When checked, time stamps the test log.
- **Test Iterations** — Selects the number of times the test is run.
- **Log output file pathname** — When checked, enables you to specify where the test log file is saved.

## Viewing Information and Results

The tabs in the **Customize** window provide information about the test and the test results. The following tabs are available:

- **Results** — Displays the test that ran and the result.
- **Errors** — Displays any errors that occurred during the test.
- **Help** — Displays information about the currently selected device, component, or test.
- **Configuration** — Displays basic configuration information about the currently selected device.
- **Parameters** — If applicable, displays parameters that you can set for the test.
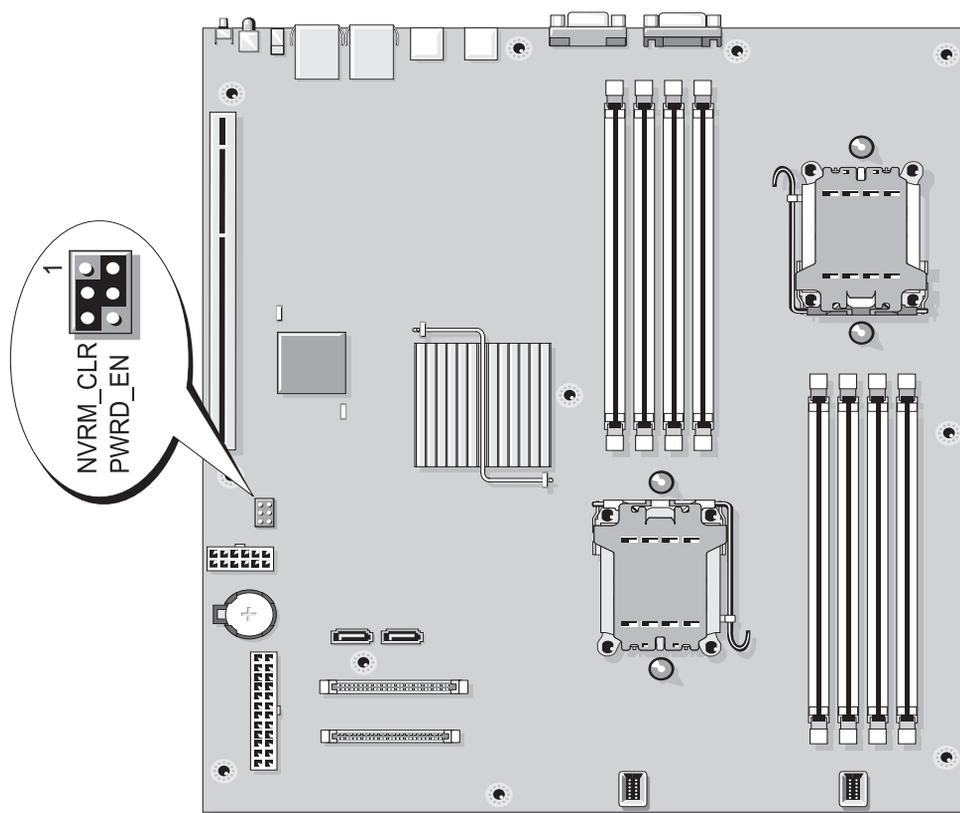
6

# Jumpers and Connectors

This section provides specific information about the system jumpers. It also provides some basic information on jumpers and switches and describes the connectors on the various boards in the system.

## System Board Jumpers

Figure 6-1 shows the location of the configuration jumpers on the system board. Table 6-1 lists the jumper settings.

**Figure 6-1.  System Board Jumpers**

**Table 6-1.  System Board Jumper Settings**

| | Jumper | Setting | | Description |
|---|---|---|---|---|
| 1 | PWRD_EN | ⊟ | (default) | The password feature is enabled. |
| | | ⊟ | | The password feature is disabled. |
| 2 | NVRM_CLR | ⊟ | (default) | The configuration settings are retained at system boot. |
| | | ⊟ | | The configuration settings are cleared at the next system boot. (If the configuration settings become corrupted to the point where the system will not boot, install the jumper and boot the system. Remove the jumper before restoring the configuration information.) |

**NOTE:** For the full name of an abbreviation or acronym used in this table, see the "Glossary" on page 121.

# Disabling a Forgotten Password

The system's software security features include a system password and a setup password, which are discussed in detail in "Using the System Setup Program" on page 23. The password jumper enables these password features or disables them and clears any password(s) currently in use.

**NOTICE:** See "Protecting Against Electrostatic Discharge" in the safety instructions in your *Product Information Guide*.

1 Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2 Open the system. See "Opening and Closing the System" on page 38.

3 Lift up the memory module shroud.

4 Remove the jumper plug from the password jumper.

See Figure 6-1 to locate the password jumper on the system board.

5 Close the system.

6 Reconnect your system and peripherals to their electrical outlets, and turn on the system.

The existing passwords are not disabled (erased) until the system boots with the password jumper plug removed. However, before you assign a new system and/or setup password, you must install the jumper plug.

**NOTE:** If you assign a new system and/or setup password with the jumper plug still removed, the system disables the new password(s) the next time it boots.

**7** Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

**8** Open the system. See "Opening and Closing the System" on page 38.

**9** Install the jumper plug on the password jumper.

**10** Lower the memory module shroud.

**11** Close the system.

**12** Reconnect your system and peripherals to their electrical outlets, and turn on the system.

**13** Assign a new system and/or setup password.

To assign a new password using the System Setup program, see "Assigning a System Password" on page 30.

# System Board Connectors

See Figure 6-2 and Table 6-2 for the location and description of system board connectors.

**Figure 6-2. System Board Connectors**
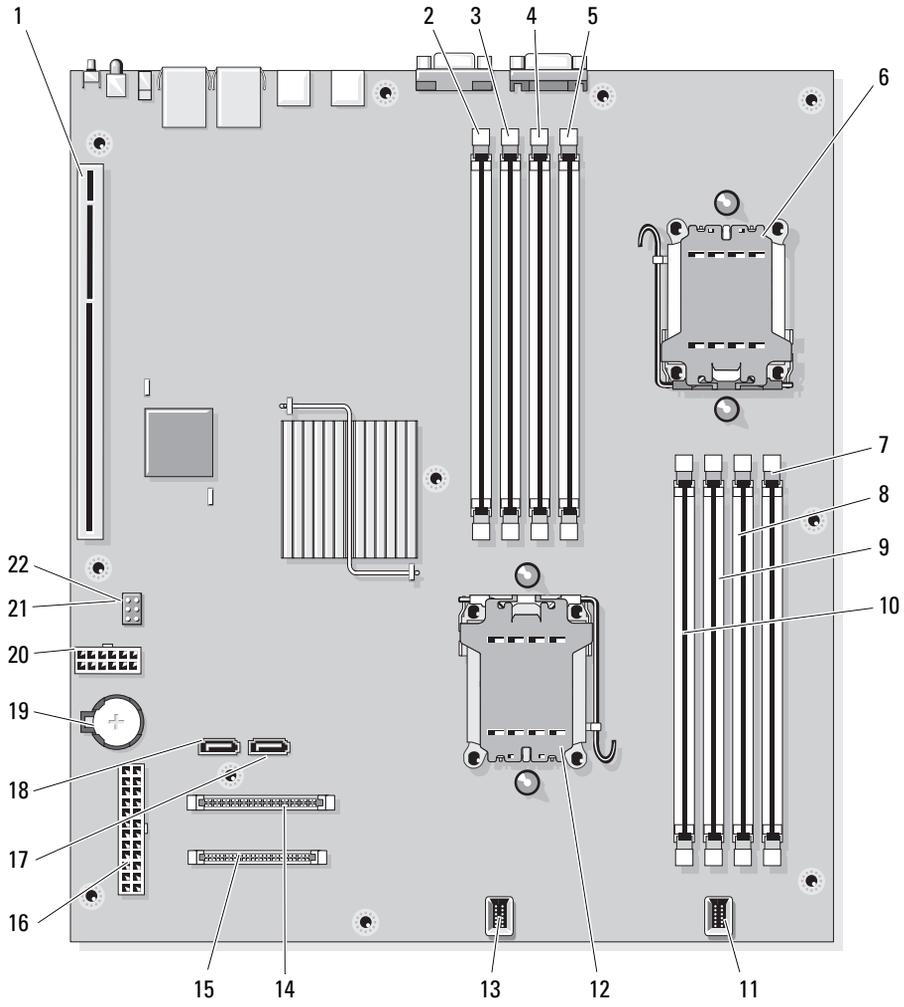
**Table 6-2.    System Board Connectors**

|    | Connector | Description |
|----|-----------|-------------|
| 1  | RISER     | Riser board connector |
| 2  | DIMM5     | Memory module connector, slot 5 |
| 3  | DIMM6     | Memory module connector, slot 6 |
| 4  | DIMM7     | Memory module connector, slot 7 |
| 5  | DIMM8     | Memory module connector, slot 8 |
| 6  | CPU2      | Microprocessor 2 connector |
| 7  | DIMM1     | Memory module connector, slot 1 |
| 8  | DIMM2     | Memory module connector, slot 2 |
| 9  | DIMM3     | Memory module connector, slot 3 |
| 10 | DIMM4     | Memory module connector, slot 4 |
| 11 | FAN_MOD2  | System cooling fan module 2 connector |
| 12 | CPU1      | Microprocessor 1 connector |
| 13 | FAN_MOD1  | System cooling fan module 1 connector |
| 14 | IDE       | Optical drive connector |
| 15 | CTRL_PNL  | Control panel connector |
| 16 | POWER1    | Power connector |
| 17 | SATA_B    | SATA B connector |
| 18 | SATA_A    | SATA A connector |
| 19 | BATTERY   | Connector for the 3.0-V battery |
| 20 | POWER2    | Power connector |
| 21 | NVRM_CLR  | NVRAM clear jumper |
| 22 | PWRD_EN   | Password enable jumper |

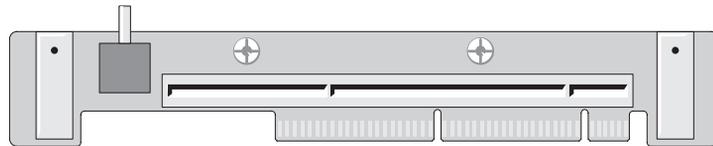**NOTE:** For the full name of an abbreviation or acronym used in this table, see the "Glossary" on page 121.

# Riser Boards

This system supports a riser board with one PCIe expansion slot (Figure 6-3), or a riser board with one PCI-X expansion slot (Figure 6-4).

**Figure 6-3.  PCIe Riser Board**
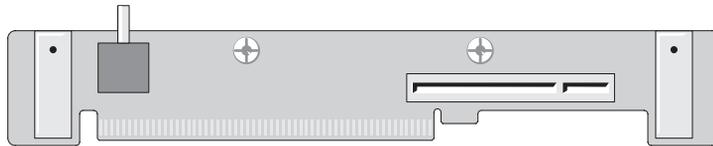


**Figure 6-4.  PCI-X Riser Board**

# 7

# Getting Help

## Technical Assistance

If you need assistance with a technical problem, perform the following steps:

1  Complete the procedures in "Troubleshooting Your System" on page 67.

2  Run the system diagnostics and record any information provided.

3  Make a copy of the Diagnostics Checklist, and fill it out.

4  Use Dell's extensive suite of online services available at Dell Support at **support.dell.com** for help with installation and troubleshooting procedures.

   For more information, see "Online Services" on page 95.

5  If the preceding steps have not resolved the problem, call Dell for technical assistance.

   **NOTE:** Call technical support from a phone near or at the system so that technical support can assist you with any necessary procedures.

   **NOTE:** Dell's Express Service Code system may not be available in all countries.

When prompted by Dell's automated telephone system, enter your Express Service Code to route the call directly to the proper support personnel. If you do not have an Express Service Code, open the **Dell Accessories** folder, double-click the **Express Service Code** icon, and follow the directions.

For instructions on using the technical support service, see "Technical Support Service" on page 96 and "Before You Call" on page 98.

   **NOTE:** Some of the following services are not always available in all locations outside the continental U.S. Call your local Dell representative for information on availability.

### Online Services

You can access Dell Support at **support.dell.com**. Select your region on the **WELCOME TO DELL SUPPORT** page, and fill in the requested details to access help tools and information.

You can contact Dell electronically using the following addresses:

• World Wide Web

   **www.dell.com/**

   **www.dell.com/ap/** (Asian/Pacific countries only)

   **www.dell.com/jp** (Japan only)

> www.euro.dell.com (Europe only)
>
> www.dell.com/la (Latin American countries)
>
> www.dell.ca (Canada only)

- Anonymous file transfer protocol (FTP)

  **ftp.dell.com/**

  Log in as user:anonymous, and use your e-mail address as your password.

- Electronic Support Service

  support@us.dell.com

  apsupport@dell.com (Asian/Pacific countries only)

  **support.jp.dell.com** (Japan only)

  **support.euro.dell.com** (Europe only)

- Electronic Quote Service

  apmarketing@dell.com (Asian/Pacific countries only)

  sales_canada@dell.com (Canada only)

## AutoTech Service

Dell's automated technical support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers about their portable and desktop computer systems.

When you call AutoTech, use your touch-tone telephone to select the subjects that correspond to your questions.

The AutoTech service is available 24 hours a day, 7 days a week. You can also access this service through the technical support service. See the contact information for your region.

## Automated Order-Status Service

To check on the status of any Dell™ products that you have ordered, you can go to **support.dell.com**, or you can call the automated order-status service. A recording prompts you for the information needed to locate and report on your order. See the contact information for your region.

## Technical Support Service

Dell's technical support service is available 24 hours a day, 7 days a week, to answer your questions about Dell hardware. Our technical support staff use computer-based diagnostics to provide fast, accurate answers.

To contact Dell's technical support service, see "Before You Call" on page 98 and then see the contact information for your region.

# Dell Enterprise Training and Certification

Dell Enterprise Training and Certification is available; see **www.dell.com/training** for more information. This service may not be offered in all locations.

# Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell for customer assistance. Have your invoice or packing slip available when you call. See the contact information for your region.

# Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit the Dell website at **www.dell.com**. For the telephone number to call to speak to a sales specialist, see the contact information for your region.

# Returning Items for Warranty Repair or Credit

Prepare all items being returned, whether for repair or credit, as follows:

1   Call Dell to obtain a Return Material Authorization Number, and write it clearly and prominently on the outside of the box.

    For the telephone number to call, see the contact information for your region.

2   Include a copy of the invoice and a letter describing the reason for the return.

3   Include a copy of any diagnostic information (including the Diagnostics Checklist) indicating the tests you have run and any error messages reported by the system diagnostics.

4   Include any accessories that belong with the item(s) being returned (such as power cables, media such as CDs and diskettes, and guides) if the return is for credit.

5   Pack the equipment to be returned in the original (or equivalent) packing materials.

    You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell. Collect-on-delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at our receiving dock and returned to you.

# Before You Call

**NOTE:** Have your Express Service Code ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

Remember to fill out the Diagnostics Checklist. If possible, turn on your system before you call Dell for technical assistance and call from a telephone at or near the computer. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the computer system itself. Ensure that the system documentation is available.

⚠ **CAUTION: Before servicing any components inside your computer, see your *Product Information Guide* for important safety information.**

**Diagnostics Checklist**

Name:

Date:

Address:

Phone number:

Service Tag (bar code on the back of the computer):

Express Service Code:

Return Material Authorization Number (if provided by Dell support technician):

Operating system and version:

Peripherals:

Expansion cards:

Are you connected to a network? Yes No

Network, version, and network card:

Programs and versions:

See your operating system documentation to determine the contents of the system's start-up files. If possible, print each file. Otherwise, record the contents of each file before calling Dell.

Description of problem and troubleshooting procedures you performed:

# Contacting Dell

To contact Dell electronically, you can access the following websites:

- www.dell.com
- support.dell.com (support)

For specific web addresses for your country, find the appropriate country section in the table below.

*NOTE:* Toll-free numbers are for use within the country for which they are listed.

*NOTE:* In certain countries, support specific to Dell XPS™ portable computers is available at a separate telephone number listed for participating countries. If you do not see a telephone number listed that is specific for XPS portable computers, you may contact Dell through the support number listed and your call will be routed appropriately.

When you need to contact Dell, use the electronic addresses, telephone numbers, and codes provided in the following table. If you need assistance in determining which codes to use, contact a local or an international operator.

*NOTE:* The contact information provided was deemed correct at the time that this document went to print and is subject to change.

| Country (City)<br>International Access Code<br>Country Code<br>City Code | Department Name or Service Area,<br>Website and E-Mail Address | Area Codes,<br>Local Numbers, and<br>Toll-Free Numbers |
| --- | --- | --- |
| Anguilla | Website: www.dell.com.ai | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 800-335-0031 |
| Antigua and Barbuda | Website: www.dell.com.ag | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | 1-800-805-5924 |
| Aomen | Technical Support (Dell™ Dimension™, Dell Inspiron™, Dell OptiPlex™, Dell Latitude™, and Dell Precision™) | 0800-105 |
| | Technical Support (servers and storage) | 0800-105 |

| Country (City)<br>International Access Code<br>Country Code<br>City Code | Department Name or Service Area,<br>Website and E-Mail Address | Area Codes,<br>Local Numbers, and<br>Toll-Free Numbers |
|---|---|---|
| **Argentina (Buenos Aires)** | Website: www.dell.com.ar | |
| International Access Code: **00** | E-mail: la-techsupport@dell.com | |
| Country Code: **54** | E-mail for desktop and portable computers:<br>la-techsupport@dell.com | |
| City Code: **11** | E-mail for servers and EMC® storage products:<br>la_enterprise@dell.com | |
| | Customer Care | toll-free: 0-800-444-0730 |
| | Technical Support | toll-free: 0-800-444-0733 |
| | Technical Support Services | toll-free: 0-800-444-0724 |
| | Sales | 0-810-444-3355 |
| **Aruba** | Website: www.dell.com.aw | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 800-1578 |
| **Australia (Sydney)** | Website: support.ap.dell.com | |
| International Access Code: **0011** | E-mail: support.ap.dell.com/contactus | |
| Country Code: **61** | Technical Support (XPS) | toll-free: 1300 790 877 |
| City Code: **2** | General Support | 13DELL-133355 |
| **Austria (Vienna)** | Website: **support.euro.dell.com** | |
| International Access Code: **900** | E-mail: tech_support_central_europe@dell.com | |
| Country Code: **43** | Home/Small Business Sales | 0820 240 530 00 |
| City Code: **1** | Home/Small Business Fax | 0820 240 530 49 |
| | Home/Small Business Customer Care | 0820 240 530 14 |
| | Preferred Accounts/Corporate Customer Care | 0820 240 530 16 |
| | Support for XPS | 0820 240 530 81 |
| | Home/Small Business Support for all other Dell<br>computers | 0820 240 530 17 |
| | Preferred Accounts/Corporate Support | 0820 240 530 17 |
| | Switchboard | 0820 240 530 00 |
| **Bahamas** | Website: www.dell.com.bs | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-866-874-3038 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| Barbados | Website: www.dell.com/bb | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | 1-800-534-3142 |
| Belgium (Brussels) | Website: support.euro.dell.com | |
| International Access Code: 00 | Tech Support for XPS | 02 481 92 96 |
| Country Code: 32 | Tech Support for all other Dell computers | 02 481 92 88 |
| City Code: 2 | Tech Support Fax | 02 481 92 95 |
| | Customer Care | 02 713 15 65 |
| | Corporate Sales | 02 481 91 00 |
| | Fax | 02 481 92 99 |
| | Switchboard | 02 481 91 00 |
| Bermuda | Website: www.dell.com/bm | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | 1-877-890-0751 |
| Bolivia | Website: www.dell.com/bo | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 800-10-0238 |
| Brazil | Website: www.dell.com/br | |
| International Access Code: 00 | E-mail: BR-TechSupport@dell.com | |
| Country Code: 55 | Customer Care and Tech Support | 0800 90 3355 |
| City Code: 51 | Technical Support Fax | 51 2104 5470 |
| | Customer Care Fax | 51 2104 5480 |
| | Sales | 0800 722 3498 |
| British Virgin Islands | General Support | toll-free: 1-866-278-6820 |
| Brunei | Technical Support (Penang, Malaysia) | 604 633 4966 |
| Country Code: 673 | Customer Care (Penang, Malaysia) | 604 633 4888 |
| | Transaction Sales (Penang, Malaysia) | 604 633 4955 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| **Canada (North York, Ontario)** | Online Order Status: **www.dell.ca/ostatus** | |
| International Access Code: **011** | Website: support.ca.dell.com | |
| | AutoTech (automated Hardware and Warranty Support) | toll-free: 1-800-247-9362 |
| | Customer Service (Home/Home Office) | toll-free: 1-800-847-4096 |
| | Customer Service (small/med./large business, government) | toll-free: 1-800-387-5757 |
| | Customer Service (printers, projectors, televisions, handhelds, digital jukebox, and wireless) | toll-free: 1-800-847-4096 |
| | Hardware Warranty Phone Support (XPS) | toll-free: 1-866-398-8977 |
| | Hardware Warranty Phone Support (Home/Home Office) | toll-free: 1-800-847-4096 |
| | Hardware Warranty Phone Support (small/med./large business, government) | toll-free: 1-800-387-5757 |
| | Hardware Warranty Phone Support (printers, projectors, televisions, handhelds, digital jukebox, and wireless) | 1-877-335-5767 |
| | Sales (Home Sales/Small Business) | toll-free: 1-800-387-5752 |
| | Sales (med./large bus., government) | toll-free: 1-800-387-5755 |
| | Spare Parts Sales & Extended Service Sales | 1 866 440 3355 |
| **Cayman Islands** | E-mail: la-techsupport@dell.com | |
| | General Support | 1-877-262-5415 |
| **Chile (Santiago)** | Website: **www.dell.com/cl** | |
| Country Code: **56** | E-mail: la-techsupport@dell.com | |
| City Code: **2** | Sales and Customer Support | toll-free: 1230-020-4823 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| China (Xiamen) | Technical Support website: **support.dell.com.cn** | |
| Country Code: **86** | Technical Support E-mail: support.dell.com.cn/email | |
| City Code: **592** | | |
| | Customer Care E-mail: customer_cn@dell.com | |
| | Technical Support Fax | 592 818 1350 |
| | Technical Support (XPS) | toll-free: 800 858 0540 |
| | Technical Support (Dimension and Inspiron) | toll-free: 800 858 2969 |
| | Technical Support (OptiPlex, Latitude, and Dell Precision) | toll-free: 800 858 0950 |
| | Technical Support (servers and storage) | toll-free: 800 858 0960 |
| | Technical Support (projectors, PDAs, switches, routers, and so on) | toll-free: 800 858 2920 |
| | Technical Support (printers) | toll-free: 800 858 2311 |
| | Customer Care | toll-free: 800 858 2060 |
| | Customer Care Fax | 592 818 1308 |
| | Home and Small Business | toll-free: 800 858 2222 |
| | Preferred Accounts Division | toll-free: 800 858 2557 |
| | Large Corporate Accounts GCP | toll-free: 800 858 2055 |
| | Large Corporate Accounts Key Accounts | toll-free: 800 858 2628 |
| | Large Corporate Accounts North | toll-free: 800 858 2999 |
| | Large Corporate Accounts North Government and Education | toll-free: 800 858 2955 |
| | Large Corporate Accounts East | toll-free: 800 858 2020 |
| | Large Corporate Accounts East Government and Education | toll-free: 800 858 2669 |
| | Large Corporate Accounts Queue Team | toll-free: 800 858 2572 |
| | Large Corporate Accounts South | toll-free: 800 858 2355 |
| | Large Corporate Accounts West | toll-free: 800 858 2811 |
| | Large Corporate Accounts Spare Parts | toll-free: 800 858 2621 |
| Colombia | Website: **www.dell.com/cl** | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | 01-800-915-4755 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| Costa Rica | Website: www.dell.com/cr | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | 0800-012-0231 |
| Czech Republic (Prague) | Website: support.euro.dell.com | |
| International Access Code: 00 | E-mail: czech_dell@dell.com | |
| Country Code: 420 | Technical Support | 22537 2727 |
| | Customer Care | 22537 2707 |
| | Fax | 22537 2714 |
| | Technical Fax | 22537 2728 |
| | Switchboard | 22537 2711 |
| Denmark (Copenhagen) | Website: support.euro.dell.com | |
| International Access Code: 00 | Technical Support for XPS | 7010 0074 |
| Country Code: 45 | Technical Support for all other Dell computers | 7023 0182 |
| | Customer Care (Relational) | 7023 0184 |
| | Home/Small Business Customer Care | 3287 5505 |
| | Switchboard (Relational) | 3287 1200 |
| | Switchboard Fax (Relational) | 3287 1201 |
| | Switchboard (Home/Small Business) | 3287 5000 |
| | Switchboard Fax (Home/Small Business) | 3287 5001 |
| Dominica | Website: www.dell.com/dm | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-866-278-6821 |
| Dominican Republic | Website: www.dell.com/do | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | 1-800-156-1588 |
| Ecuador | Website: www.dell.com/ec | |
| | E-mail: la-techsupport@dell.com | |
| | General Support (calling from Quito) | toll-free: 999-119-877-655-3355 |
| | General Support (calling from Guayaquil) | toll-free: 1800-999-119-877-655-3355 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| El Salvador | Website: www.dell.com/ec | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | 800-6132 |
| Finland (Helsinki) | Website: support.euro.dell.com | |
| International Access Code: 990 | E-mail: fi_support@dell.com | |
| Country Code: 358 | Technical Support | 0207 533 555 |
| City Code: 9 | Customer Care | 0207 533 538 |
| | Switchboard | 0207 533 533 |
| | Sales under 500 employees | 0207 533 540 |
| | Fax | 0207 533 530 |
| | Sales over 500 employees | 0207 533 533 |
| | Fax | 0207 533 530 |
| France (Paris) (Montpellier) | Website: support.euro.dell.com | |
| International Access Code: 00 | **Home and Small Business** | |
| Country Code: 33 | Technical Support for XPS | 0825 387 129 |
| City Codes: (1) (4) | Technical Support for all other Dell computers | 0825 387 270 |
| | Customer Care | 0825 823 833 |
| | Switchboard | 0825 004 700 |
| | Switchboard (calls from outside of France) | 04 99 75 40 00 |
| | Sales | 0825 004 700 |
| | Fax | 0825 004 701 |
| | Fax (calls from outside of France) | 04 99 75 40 01 |
| | **Corporate** | |
| | Technical Support | 0825 004 719 |
| | Customer Care | 0825 338 339 |
| | Switchboard | 01 55 94 71 00 |
| | Sales | 01 55 94 71 00 |
| | Fax | 01 55 94 71 01 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| **Germany (Frankfurt)** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | E-mail: tech_support_central_europe@dell.com | |
| Country Code: **49** | Technical Support for XPS | 069 9792 7222 |
| City Code: **69** | Technical Support for all other Dell computers | 069 9792-7200 |
| | Home/Small Business Customer Care | 0180-5-224400 |
| | Global Segment Customer Care | 069 9792-7320 |
| | Preferred Accounts Customer Care | 069 9792-7320 |
| | Large Accounts Customer Care | 069 9792-7320 |
| | Public Accounts Customer Care | 069 9792-7320 |
| | Switchboard | 069 9792-7000 |
| **Greece** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | Technical Support | 00800-44 14 95 18 |
| Country Code: **30** | Gold Service Technical Support | 00800-44 14 00 83 |
| | Switchboard | 2108129810 |
| | Gold Service Switchboard | 2108129811 |
| | Sales | 2108129800 |
| | Fax | 2108129812 |
| **Grenada** | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-866-540-3355 |
| **Guatemala** | E-mail: la-techsupport@dell.com | |
| | General Support | 1-800-999-0136 |
| **Guyana** | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-877-270-4609 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| **Hong Kong** International Access Code: **001** Country Code: **852** | Website: support.ap.dell.com | |
| | Technical Support E-mail: support.dell.com.cn/email | |
| | Technical Support (XPS) | 00852-3416 6923 |
| | Technical Support (Dimension and Inspiron) | 00852-2969 3188 |
| | Technical Support (OptiPlex, Latitude, and Dell Precision) | 00852-2969 3191 |
| | Technical Support (servers and storage) | 00852-2969 3196 |
| | Technical Support (projectors, PDAs, switches, routers, and so on) | 00852-3416 0906 |
| | Customer Care | 00852-3416 0910 |
| | Large Corporate Accounts | 00852-3416 0907 |
| | Global Customer Programs | 00852-3416 0908 |
| | Medium Business Division | 00852-3416 0912 |
| | Home and Small Business Division | 00852-2969 3105 |
| **India** | Website: support.ap.dell.com | |
| | E-mail: india_support_desktop@dell.com india_support_notebook@dell.com india_support_Server@dell.com | |
| | Technical Support (XPS computers) | 0802 506 8033 or toll-free: 1800 425 2066 |
| | Technical Support (portables, desktops, servers, and storage) | 1600338045 and 1600448046 |
| | Sales (Large Corporate Accounts) | 1600 33 8044 |
| | Sales (Home and Small Business) | 1600 33 8046 |

| Country (City)<br>International Access Code<br>Country Code<br>City Code | Department Name or Service Area,<br>Website and E-Mail Address | Area Codes,<br>Local Numbers, and<br>Toll-Free Numbers |
|---|---|---|
| **Ireland (Cherrywood)**<br><br>International Access Code: **00**<br><br>Country Code: **353**<br><br>City Code: **1** | Website: **support.euro.dell.com** | |
| | E-mail: dell_direct_support@dell.com | |
| | **Sales** | |
| | Ireland Sales | 01 204 4444 |
| | Dell Outlet | 1850 200 778 |
| | Online Ordering HelpDesk | 1850 200 778 |
| | **Customer Care** | |
| | Home User Customer Care | 01 204 4014 |
| | Small Business Customer Care | 01 204 4014 |
| | Corporate Customer Care | 1850 200 982 |
| | **Technical Support** | |
| | Technical Support for XPS computers only | 1850 200 722 |
| | Technical Support for all other Dell computers | 1850 543 543 |
| | **General** | |
| | Fax/Sales Fax | 01 204 0103 |
| | Switchboard | 01 204 4444 |
| | U.K. Customer Care (dial within U.K. only) | 0870 906 0010 |
| | Corporate Customer Care (dial within U.K. only) | 0870 907 4499 |
| | U.K. Sales (dial within U.K. only) | 0870 907 4000 |
| **Italy (Milan)**<br><br>International Access Code: **00**<br><br>Country Code: **39**<br><br>City Code: **02** | Website: **support.euro.dell.com** | |
| | **Home and Small Business** | |
| | Technical Support | 02 577 826 90 |
| | Customer Care | 02 696 821 14 |
| | Fax | 02 696 821 13 |
| | Switchboard | 02 696 821 12 |
| | **Corporate** | |
| | Technical Support | 02 577 826 90 |
| | Customer Care | 02 577 825 55 |
| | Fax | 02 575 035 30 |
| | Switchboard | 02 577 821 |

| Country (City)<br>International Access Code<br>Country Code<br>City Code | Department Name or Service Area,<br>Website and E-Mail Address | Area Codes,<br>Local Numbers, and<br>Toll-Free Numbers |
|---|---|---|
| Jamaica | E-mail: la-techsupport@dell.com | |
| | General Support (dial from within Jamaica only) | 1-800-440-9205 |
| Japan (Kawasaki) | Website: **support.jp.dell.com** | |
| International Access Code: 001 | Technical Support (XPS) | toll-free: 0120-937-786 |
| Country Code: 81 | Technical Support outside of Japan (XPS) | 044-520-1235 |
| City Code: 44 | XPS Customer Care (if ordered items are missing or have been damaged during shipment) | 044-556-4240 |
| | Technical Support (Dimension and Inspiron) | toll-free: 0120-198-226 |
| | Technical Support outside of Japan (Dimension and Inspiron) | 81-44-520-1435 |
| | Technical Support (Dell Precision, OptiPlex, and Latitude) | toll-free: 0120-198-433 |
| | Technical Support outside of Japan (Dell Precision, OptiPlex, and Latitude) | 81-44-556-3894 |
| | Technical Support (Dell PowerApp™, Dell PowerEdge™, Dell PowerConnect™, and Dell PowerVault™) | toll-free: 0120-198-498 |
| | Technical Support outside of Japan (PowerApp, PowerEdge, PowerConnect, and PowerVault) | 81-44-556-4162 |
| | Technical Support (projectors, PDAs, printers, routers) | toll-free: 0120-981-690 |
| | Technical Support outside of Japan (projectors, PDAs, printers, routers) | 81-44-556-3468 |
| | Faxbox Service | 044-556-3490 |
| | 24-Hour Automated Order Status Service | 044-556-3801 |
| | Customer Care | 044-556-4240 |
| | Business Sales Division (up to 400 employees) | 044-556-1465 |
| | Preferred Accounts Division Sales (over 400 employees) | 044-556-3433 |
| | Public Sales (government agencies, educational institutions, and medical institutions) | 044-556-5963 |
| | Global Segment Japan | 044-556-3469 |
| | Individual User | 044-556-1760 |
| | Switchboard | 044-556-4300 |

| Country (City)<br>International Access Code<br>Country Code<br>City Code | Department Name or Service Area,<br>Website and E-Mail Address | Area Codes,<br>Local Numbers, and<br>Toll-Free Numbers |
|---|---|---|
| **Korea (Seoul)** | E-mail: krsupport@dell.com | |
| International Access Code: **001** | Support | toll-free: 080-200-3800 |
| Country Code: **82** | Technical Support (XPS) | toll-free: 080-999-0283 |
| City Code: **2** | Support (Dimension, PDA, Electronics, and Accessories) | toll-free: 080-200-3801 |
| | Sales | toll-free: 080-200-3600 |
| | Fax | 2194-6202 |
| | Switchboard | 2194-6000 |
| **Latin America** | Customer Technical Support (Austin, Texas, U.S.A.) | 512 728-4093 |
| | Customer Service (Austin, Texas, U.S.A.) | 512 728-3619 |
| | Fax (Technical Support and Customer Service) (Austin, Texas, U.S.A.) | 512 728-3883 |
| | Sales (Austin, Texas, U.S.A.) | 512 728-4397 |
| | SalesFax (Austin, Texas, U.S.A.) | 512 728-4600 |
| | | or 512 728-3772 |
| **Luxembourg** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | Support | 342 08 08 075 |
| Country Code: **352** | Home/Small Business Sales | +32 (0)2 713 15 96 |
| | Corporate Sales | 26 25 77 81 |
| | Customer Care | +32 (0)2 481 91 19 |
| | Fax | 26 25 77 82 |
| **Macao** | Technical Support | toll-free: 0800 105 |
| Country Code: **853** | Customer Service (Xiamen, China) | 34 160 910 |
| | Transaction Sales (Xiamen, China) | 29 693 115 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| **Malaysia (Penang)** | Website: **support.ap.dell.com** | |
| International Access Code: **00** | Technical Support (XPS) | toll-free: 1800 885 784 |
| Country Code: **60** | Technical Support (Dell Precision, OptiPlex, and Latitude) | toll-free: 1 800 880 193 |
| City Code: **4** | Technical Support (Dimension, Inspiron, and Electronics and Accessories) | toll-free: 1 800 881 306 |
| | Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault) | toll-free: 1800 881 386 |
| | Customer Care | toll-free: 1800 881 306 (option 6) |
| | Transaction Sales | toll-free: 1 800 888 202 |
| | Corporate Sales | toll-free: 1 800 888 213 |
| **Mexico** | E-mail: la-techsupport@dell.com | |
| International Access Code: **00** | Customer Technical Support | 001-877-384-8979 or 001-877-269-3383 |
| Country Code: **52** | Sales | 50-81-8800 or 01-800-888-3355 |
| | Customer Service | 001-877-384-8979 or 001-877-269-3383 |
| | Main | 50-81-8800 or 01-800-888-3355 |
| **Montserrat** | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-866-278-6822 |
| **Netherlands Antilles** | E-mail: la-techsupport@dell.com | |
| | General Support | 001-800-882-1519 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| **Netherlands (Amsterdam)** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | Technical Support for XPS | 020 674 45 94 |
| Country Code: **31** | Technical Support for all other Dell computers | 020 674 45 00 |
| City Code: **20** | Technical Support Fax | 020 674 47 66 |
| | Home/Small Business Customer Care | 020 674 42 00 |
| | Relational Customer Care | 020 674 4325 |
| | Home/Small Business Sales | 020 674 55 00 |
| | Relational Sales | 020 674 50 00 |
| | Home/Small Business Sales Fax | 020 674 47 75 |
| | Relational Sales Fax | 020 674 47 50 |
| | Switchboard | 020 674 50 00 |
| | Switchboard Fax | 020 674 47 50 |
| **New Zealand** | Website: **support.ap.dell.com** | |
| International Access Code: **00** | E-mail: support.ap.dell.com/contactus | |
| Country Code: **64** | Technical Support (XPS) | toll-free: 0800 335 540 |
| | General Support | 0800 441 567 |
| **Nicaragua** | E-mail: la-techsupport@dell.com | |
| | General Support | 001-800-220-1377 |
| **Norway (Lysaker)** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | Technical Support for XPS | 815 35 043 |
| Country Code: **47** | Technical Support for all other Dell products | 671 16882 |
| | Relational Customer Care | 671 17575 |
| | Home/Small Business Customer Care | 23162298 |
| | Switchboard | 671 16800 |
| | Fax Switchboard | 671 16865 |
| **Panama** | E-mail: la-techsupport@dell.com | |
| | General Support | 011-800-507-1264 |
| **Peru** | E-mail: la-techsupport@dell.com | |
| | General Support | 0800-50-669 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| **Poland (Warsaw)** | Website: **support.euro.dell.com** | |
| International Access Code: **011** | E-mail: pl_support_tech@dell.com | |
| Country Code: **48** | Customer Service Phone | 57 95 700 |
| City Code: **22** | Customer Care | 57 95 999 |
| | Sales | 57 95 999 |
| | Customer Service Fax | 57 95 806 |
| | Reception Desk Fax | 57 95 998 |
| | Switchboard | 57 95 999 |
| **Portugal** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | Technical Support | 707200149 |
| Country Code: **351** | Customer Care | 800 300 413 |
| | Sales | 800 300 410 or 800 300 411 or 800 300 412 or 21 422 07 10 |
| | Fax | 21 424 01 12 |
| **Puerto Rico** | E-mail: la-techsupport@dell.com | |
| | General Support | 1-877-537-3355 |
| **St. Kitts and Nevis** | Website: **www.dell.com/kn** | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-866-540-3355 |
| **St. Lucia** | Website: **www.dell.com/lc** | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-866-464-4352 |
| **St. Vincent and the Grenadines** | Website: **www.dell.com/vc** | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-866-464-4353 |

| Country (City)<br>International Access Code<br>Country Code<br>City Code | Department Name or Service Area,<br>Website and E-Mail Address | Area Codes,<br>Local Numbers, and<br>Toll-Free Numbers |
|---|---|---|
| Singapore (Singapore)<br>International Access Code: 005<br>Country Code: 65 | **NOTE:** The phone numbers in this section should be called from within Singapore or Malaysia only. | |
| | Website: support.ap.dell.com | |
| | Technical Support (XPS) | toll-free: 1800 394 7464 |
| | Technical Support (Dimension, Inspiron, and Electronics and Accessories) | toll-free: 1 800 394 7430 |
| | Technical Support (OptiPlex, Latitude, and Dell Precision) | toll-free: 1 800 394 7488 |
| | Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault) | toll-free: 1 800 394 7478 |
| | Customer Care | toll-free: 1 800 394 7430<br>(option 6) |
| | Transaction Sales | toll-free: 1 800 394 7412 |
| | Corporate Sales | toll-free: 1 800 394 7419 |
| Slovakia (Prague)<br>International Access Code: 00<br>Country Code: 421 | Website: support.euro.dell.com | |
| | E-mail: czech_dell@dell.com | |
| | Technical Support | 02 5441 5727 |
| | Customer Care | 420 22537 2707 |
| | Fax | 02 5441 8328 |
| | Tech Fax | 02 5441 8328 |
| | Switchboard (Sales) | 02 5441 7585 |
| South Africa (Johannesburg)<br>International Access Code:<br>09/091<br>Country Code: 27<br>City Code: 11 | Website: support.euro.dell.com | |
| | E-mail: dell_za_support@dell.com | |
| | Gold Queue | 011 709 7713 |
| | Technical Support | 011 709 7710 |
| | Customer Care | 011 709 7707 |
| | Sales | 011 709 7700 |
| | Fax | 011 706 0495 |
| | Switchboard | 011 709 7700 |
| Southeast Asian and Pacific Countries | Technical Support, Customer Service, and Sales (Penang, Malaysia) | 604 633 4810 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
| --- | --- | --- |
| **Spain (Madrid)** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | **Home and Small Business** | |
| Country Code: **34** | Technical Support | 902 100 130 |
| City Code: **91** | Customer Care | 902 118 540 |
| | Sales | 902 118 541 |
| | Switchboard | 902 118 541 |
| | Fax | 902 118 539 |
| | **Corporate** | |
| | Technical Support | 902 100 130 |
| | Customer Care | 902 115 236 |
| | Switchboard | 91 722 92 00 |
| | Fax | 91 722 95 83 |
| **Sweden (Upplands Vasby)** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | Technical Support for XPS | 0771 340 340 |
| Country Code: **46** | Technical Support for all other Dell products | 08 590 05 199 |
| City Code: **8** | Relational Customer Care | 08 590 05 642 |
| | Home/Small Business Customer Care | 08 587 70 527 |
| | Employee Purchase Program (EPP) Support | 020 140 14 44 |
| | Technical Support Fax | 08 590 05 594 |
| | Sales | 08 590 05 185 |
| **Switzerland (Geneva)** | Website: **support.euro.dell.com** | |
| International Access Code: **00** | E-mail: Tech_support_central_Europe@dell.com | |
| Country Code: **41** | Technical Support for XPS | 0848 33 88 57 |
| City Code: **22** | Technical Support (Home and Small Business) for all other Dell products | 0844 811 411 |
| | Technical Support (Corporate) | 0844 822 844 |
| | Customer Care (Home and Small Business) | 0848 802 202 |
| | Customer Care (Corporate) | 0848 821 721 |
| | Fax | 022 799 01 90 |
| | Switchboard | 022 799 01 01 |

| Country (City)<br>International Access Code<br>Country Code<br>City Code | Department Name or Service Area,<br>Website and E-Mail Address | Area Codes,<br>Local Numbers, and<br>Toll-Free Numbers |
|---|---|---|
| Taiwan | Website: **support.ap.dell.com** | |
| International Access Code: **002** | E-mail: support.dell.com.cn/email | |
| Country Code: **886** | Technical Support (XPS) | toll-free: 0080 186 3085 |
| | Technical Support (OptiPlex, Latitude, Inspiron, Dimension, and Electronics and Accessories) | toll-free: 0080 186 1011 |
| | Technical Support (servers and storage) | toll-free: 0080 160 1256 |
| | Customer Care | toll-free: 0080 160 1250<br>(option 5) |
| | Transaction Sales | toll-free: 0080 165 1228 |
| | Corporate Sales | toll-free: 0080 165 1227 |
| Thailand | Website: **support.ap.dell.com** | |
| International Access Code: **001** | Technical Support (OptiPlex, Latitude, and Dell Precision) | toll-free: 1800 0060 07 |
| Country Code: **66** | Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault) | toll-free: 1800 0600 09 |
| | Customer Care | toll-free: 1800 006 007<br>(option 7) |
| | Corporate Sales | toll-free: 1800 006 009 |
| | Transaction Sales | toll-free: 1800 006 006 |
| Trinidad/Tobago | Website: **www.dell.com/tt** | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-888-799-5908 |
| Turks and Caicos Islands | Website: **www.dell.com/tc** | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-877-441-4735 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| U.K. (Bracknell) | Website: **support.euro.dell.com** | |
| International Access Code: **00** | E-mail: dell_direct_support@dell.com | |
| Country Code: **44** | Customer Care website: | |
| City Code: **1344** | **support.euro.dell.com/uk/en/ECare/form/home.asp** | |
| | **Sales** | |
| | Home and Small Business Sales | 0870 907 4000 |
| | Corporate/Public Sector Sales | 01344 860 456 |
| | **Customer Care** | |
| | Home and Small Business Customer Care | 0870 906 0010 |
| | Corporate Customer Care | 01344 373 185 |
| | Preferred Accounts (500–5000 employees) | 0870 906 0010 |
| | Global Accounts Customer Care | 01344 373 186 |
| | Central Government Customer Care | 01344 373 193 |
| | Local Government & Education Customer Care | 01344 373 199 |
| | Health Customer Care | 01344 373 194 |
| | **Technical Support** | |
| | Technical Support for XPS computers only | 0870 366 4180 |
| | Technical Support (Corporate/Preferred Accounts/PCA [1000+ employees]) | 0870 908 0500 |
| | Technical Support for all other products | 0870 353 0800 |
| | **General** | |
| | Home and Small Business Fax | 0870 907 4006 |
| Uruguay | Website: **www.dell.com/uy** | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 000-413-598-2521 |

| Country (City) International Access Code Country Code City Code | Department Name or Service Area, Website and E-Mail Address | Area Codes, Local Numbers, and Toll-Free Numbers |
|---|---|---|
| **U.S.A. (Austin, Texas)** | Automated Order-Status Service | toll-free: 1-800-433-9014 |
| International Access Code: 011 | AutoTech (portable and desktop computers) | toll-free: 1-800-247-9362 |
| Country Code: 1 | Hardware and Warranty Support (Dell **TV, Printers, and Projectors**) for Relationship customers | toll-free: 1-877-459-7298 |
| | Americas Consumer XPS Support | toll-free: 1-800-232-8544 |
| | **Consumer** (Home and Home Office) Support for all other Dell products | toll-free: 1-800-624-9896 |
| | Customer Service | toll-free: 1-800-624-9897 |
| | Employee Purchase Program (EPP) Customers | toll-free: 1-800-695-8133 |
| | Financial Services website: **www.dellfinancialservices.com** | |
| | Financial Services (lease/loans) | toll-free: 1-877-577-3355 |
| | Financial Services (Dell Preferred Accounts [DPA]) | toll-free: 1-800-283-2210 |
| | **Business** | |
| | Customer Service and Support | toll-free: 1-800-456-3355 |
| | Employee Purchase Program (EPP) Customers | toll-free: 1-800-695-8133 |
| | Support for printers, projectors, PDAs, and MP3 players | toll-free: 1-877-459-7298 |
| | **Public** (government, education, and healthcare) | |
| | Customer Service and Support | toll-free: 1-800-456-3355 |
| | Employee Purchase Program (EPP) Customers | toll-free: 1-800-695-8133 |
| | Dell Sales | toll-free: 1-800-289-3355 or toll-free: 1-800-879-3355 |
| | Dell Outlet Store (Dell refurbished computers) | toll-free: 1-888-798-7561 |
| | Software and Peripherals Sales | toll-free: 1-800-671-3355 |
| | Spare Parts Sales | toll-free: 1-800-357-3355 |
| | Extended Service and Warranty Sales | toll-free: 1-800-247-4618 |
| | Fax | toll-free: 1-800-727-8320 |
| | Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired | toll-free: 1-877-DELLTTY (1-877-335-5889) |

| Country (City)<br>International Access Code<br>Country Code<br>City Code | Department Name or Service Area,<br>Website and E-Mail Address | Area Codes,<br>Local Numbers, and<br>Toll-Free Numbers |
|---|---|---|
| **U.S. Virgin Islands** | E-mail: la-techsupport@dell.com | |
| | General Support | toll-free: 1-877-702-4360 |
| **Venezuela** | Website: **www.dell.com/ve** | |
| | E-mail: la-techsupport@dell.com | |
| | General Support | 0800-100-4752 |

# Glossary

This section defines or identifies technical terms, abbreviations, and acronyms used in your system documents.

**A** — Ampere(s).

**AC** — Alternating current.

**ACPI** — Advanced Configuration and Power Interface. A standard interface for enabling the operating system to direct configuration and power management.

**ambient temperature** — The temperature of the area or room where the system is located.

**ANSI** — American National Standards Institute. The primary organization for developing technology standards in the U.S.

**application** — Software designed to help you perform a specific task or series of tasks. Applications run from the operating system.

**ASCII** — American Standard Code for Information Interchange.

**asset tag** — An individual code assigned to a system, usually by an administrator, for security or tracking purposes.

**backup** — A copy of a program or data file. As a precaution, back up your system's hard drive on a regular basis. Before making a change to the configuration of your system, back up important start-up files from your operating system.

**backup battery** — A battery that maintains system configuration, date, and time information in a special section of memory when the system is turned off.

**BIOS** — Basic input/output system. Your system's BIOS contains programs stored on a flash memory chip. The BIOS controls the following:

- Communications between the processor and peripheral devices
- Miscellaneous functions, such as system messages

**bit** — The smallest unit of information interpreted by your system.

**blade** — A module that contains a processor, memory, and a hard drive. The modules are mounted into a chassis that includes power supplies and fans.

**BMC** — Baseboard management controller.

**boot routine** — A program that clears all memory, initializes devices, and loads the operating system when you start your system. Unless the operating system fails to respond, you can reboot (also called *warm boot*) your system by pressing <Ctrl><Alt><Del>. Otherwise, you must restart the system by pressing the reset button or by turning the system off and then back on.

**bootable diskette** — A diskette that is used to start your system if the system will not boot from the hard drive.

**BTU** — British thermal unit.

**bus** — An information pathway between the components of a system. Your system contains an expansion bus that allows the processor to communicate with controllers for the peripheral devices connected to the system. Your system also contains an address bus and a data bus for communications between the processor and RAM.

**C** — Celsius.

**cache** — A fast storage area that keeps a copy of data or instructions for quick data retrieval. When a program makes a request to a disk drive for data that is in the cache, the disk-cache utility can retrieve the data from RAM faster than from the disk drive.

**CD** — Compact disc. CD drives use optical technology to read data from CDs.

**cm** — Centimeter(s).

**cmos** — Complementary metal-oxide semiconductor.

**component** — As they relate to DMI, components include operating systems, computer systems, expansion cards, and peripherals that are compatible with DMI. Each component is made up of groups and attributes that are defined as relevant to that component.

**COM*n*** — The device names for the serial ports on your system.

**control panel** — The part of the system that contains indicators and controls, such as the power button and power indicator.

**controller** — A chip that controls the transfer of data between the processor and memory or between the processor and a peripheral.

**conventional memory** — The first 640 KB of RAM. Conventional memory is found in all systems. Unless they are specially designed, MS-DOS® programs are limited to running in conventional memory.

**coprocessor** — A chip that relieves the system's processor of specific processing tasks. A math coprocessor, for example, handles numeric processing.

**CPU** — Central processing unit. See *processor*.

**DC** — Direct current.

**DDR** — Double-data rate. A technology in memory modules that potentially doubles the output.

**device driver** — A program that allows the operating system or some other program to interface correctly with a peripheral. Some device drivers—such as network drivers—must be loaded from the **config.sys** file or as memory-resident programs (usually, from the **autoexec.bat** file). Others must load when you start the program for which they were designed.

**DHCP** — Dynamic Host Configuration Protocol. A method of automatically assigning an IP address to a client system.

**diagnostics** — A comprehensive set of tests for your system.

**DIMM** — Dual in-line memory module. See also *memory module*.

**DIN** — *Deutsche Industrie Norm*.

**directory** — Directories help keep related files organized on a disk in a hierarchical, "inverted tree" structure. Each disk has a "root" directory. Additional directories that branch off the root directory are called *subdirectories*. Subdirectories may contain additional directories branching off them.

**DMA** — Direct memory access. A DMA channel allows certain types of data transfer between RAM and a device to bypass the processor.

**DMI** — Desktop Management Interface. DMI enables the management of your system's software and hardware by collecting information about the system's components, such as the operating system, memory, peripherals, expansion cards, and asset tag.

**DNS** — Domain Name System. A method of translating Internet domain names, such as **www.dell.com**, into IP addresses, such as 143.166.83.200.

**DRAM** — Dynamic random-access memory. A system's RAM is usually made up entirely of DRAM chips.

**DVD** — Digital versatile disc.

**ECC** — Error checking and correction.

**EEPROM** — Electronically erasable programmable read-only memory.

**EMC** — Electromagnetic compatibility.

**EMI** — Electromagnetic interference.

**ESD** — Electrostatic discharge.

**ESM** — Embedded server management.

**expansion bus** — Your system contains an expansion bus that allows the processor to communicate with controllers for peripherals, such as NICs.

**expansion card** — An add-in card, such as a NIC or SCSI adapter, that plugs into an expansion-card connector on the system board. An expansion card adds some specialized function to the system by providing an interface between the expansion bus and a peripheral.

**expansion-card connector** — A connector on the system board or riser board for plugging in an expansion card.

**F** — Fahrenheit.

**FAT** — File allocation table. The file system structure used by MS-DOS to organize and keep track of file storage. The Microsoft® Windows® operating systems can optionally use a FAT file system structure.

**FBD** — Fully buffered DIMM.

**flash memory** — A type of EEPROM chip that can be reprogrammed from a utility on diskette while still installed in a system; most EEPROM chips can only be rewritten with special programming equipment.

**format** — To prepare a hard drive or diskette for storing files. An unconditional format deletes all data stored on the disk.

**FSB** — Front-side bus. The FSB is the data path and physical interface between the processor and the main memory (RAM).

**ft** — Feet.

**FTP** — File transfer protocol.

**g** — Gram(s).

**G** — Gravities.

**Gb** — Gigabit(s); 1024 megabits or 1,073,741,824 bits.

**GB** — Gigabyte(s); 1024 megabytes or 1,073,741,824 bytes. However, when referring to hard-drive capacity, the term is usually rounded to 1,000,000,000 bytes.

**graphics mode** — A video mode that can be defined as *x* horizontal by *y* vertical pixels by *z* colors.

**group** — As it relates to DMI, a group is a data structure that defines common information, or attributes, about a manageable component.

**guarding** — A type of data redundancy in which a set of physical drives stores data and an additional drive stores parity data. See also *mirroring*, *striping*, and *RAID*.

**h** — Hexadecimal. A base-16 numbering system, often used in programming to identify addresses in the system's RAM and I/O memory addresses for devices. In text, hexadecimal numbers are often followed by *h*.

**headless system** — A system or device that functions without having a keyboard, mouse, or monitor attached. Normally, headless systems are managed over a network using an Internet browser.

**host adapter** — A host adapter implements communication between the system's bus and the controller for a peripheral device. (Hard-drive controller subsystems include integrated host adapter circuitry.) To add a SCSI expansion bus to your system, you must install or connect the appropriate host adapter.

**hot plug** — Describes the feature of the system that enables you to swap a component of the system while the system is running.

**Hz** — Hertz.

**I/O** — Input/output. A keyboard is an input device, and a monitor is an output device. In general, I/O activity can be differentiated from computational activity.

**ID** — Identification.

**IDE** — Integrated drive electronics. A standard interface between the system board and storage devices.

**integrated mirroring** — Provides simultaneous physical mirroring of two drives. Integrated mirroring functionality is provided by the system's hardware. See also *mirroring*.

**internal processor cache** — An instruction and data cache built into the processor.

**IP** — Internet Protocol.

**IPX** — Internet package exchange.

**IRQ** — Interrupt request. A signal that data is about to be sent to or received by a peripheral device travels by an IRQ line to the processor. Each peripheral connection must be assigned an IRQ number. Two devices can share the same IRQ assignment, but you cannot operate both devices simultaneously.

**jumper** — Small blocks on a circuit board with two or more pins emerging from them. Plastic plugs containing a wire fit down over the pins. The wire connects the pins and creates a circuit, providing a simple and reversible method of changing the circuitry in a board.

**K** — Kilo-; 1000.

**Kb** — Kilobit(s); 1024 bits.

**KB** — Kilobyte(s); 1024 bytes.

**Kbps** — Kilobit(s) per second.

**KBps** — Kilobyte(s) per second.

**key combination** — A command requiring you to press multiple keys at the same time (for example, <Ctrl><Alt><Del>).

**kg** — Kilogram(s); 1000 grams.

**kHz** — Kilohertz.

**KMM** — Keyboard/monitor/mouse.

**KVM** — Keyboard/video/mouse. KVM refers to a switch that allows selection of the system from which the video is displayed and for which the keyboard and mouse are used.

**LAN** — Local area network. A LAN is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

**lb** — Pound(s).

**LCD** — Liquid crystal display.

**LED** — Light-emitting diode. An electronic device that lights up when a current is passed through it.

**LGA** — Land grid array. A type of processor socket. Unlike the PGA interface, the LGA interface has no pins on the chip; instead, the chip has pads that contact pins on the system board.

**Linux** — A UNIX-like operating system that runs on a variety of hardware systems. Linux is open source software, which is freely available; however, the full distribution of Linux along with technical support and training are available for a fee from vendors such as Red Hat Software.

**local bus** — On a system with local-bus expansion capability, certain peripheral devices (such as the video adapter circuitry) can be designed to run much faster than they would with a traditional expansion bus. See also *bus*.

**LVD** — Low voltage differential.

**m** — Meter(s).

**mA** — Milliampere(s).

**MAC address** — Media Access Control address. Your system's unique hardware number on a network.

**mAh** — Milliampere-hour(s).

**Mb** — Megabit(s); 1,048,576 bits.

**MB** — Megabyte(s); 1,048,576 bytes. However, when referring to hard-drive capacity, the term is often rounded to mean 1,000,000 bytes.

**Mbps** — Megabits per second.

**MBps** — Megabytes per second.

**MBR** — Master boot record.

**memory address** — A specific location, usually expressed as a hexadecimal number, in the system's RAM.

**memory module** — A small circuit board containing DRAM chips that connects to the system board.

**memory** — An area in your system that stores basic system data. A system can contain several different forms of memory, such as integrated memory (ROM and RAM) and add-in memory modules (DIMMs).

**MHz** — Megahertz.

**mirroring** — A type of data redundancy in which a set of physical drives stores data and one or more sets of additional drives stores duplicate copies of the data. Mirroring functionality is provided by software. See also *guarding*, *integrated mirroring*, *striping*, and *RAID*.

**mm** — Millimeter(s).

**ms** — Millisecond(s).

**MS-DOS®** — Microsoft Disk Operating System.

**NAS** — Network Attached Storage. NAS is one of the concepts used for implementing shared storage on a network. NAS systems have their own operating systems, integrated hardware, and software that are optimized to serve specific storage needs.

**NIC** — Network interface controller. A device that is installed or integrated in a system to allow connection to a network.

**NMI** — Nonmaskable interrupt. A device sends an NMI to signal the processor about hardware errors.

**ns** — Nanosecond(s).

**NTFS** — The NT File System option in the Windows 2000 operating system.

**NVRAM** — Nonvolatile random-access memory. Memory that does not lose its contents when you turn off your system. NVRAM is used for maintaining the date, time, and system configuration information.

**parity** — Redundant information that is associated with a block of data.

**partition** — You can divide a hard drive into multiple physical sections called *partitions* with the **fdisk** command. Each partition can contain multiple logical drives. You must format each logical drive with the **format** command.

**PCI** — Peripheral Component Interconnect. A standard for local-bus implementation.

**PDU** — Power distribution unit. A power source with multiple power outlets that provides electrical power to servers and storage systems in a rack.

**peripheral** — An internal or external device, such as a diskette drive or keyboard, connected to a system.

**PGA** — Pin grid array. A type of processor socket that allows you to remove the processor chip.

**pixel** — A single point on a video display. Pixels are arranged in rows and columns to create an image. A video resolution, such as 640 x 480, is expressed as the number of pixels across by the number of pixels up and down.

**POST** — Power-on self-test. Before the operating system loads when you turn on your system, the POST tests various system components such as RAM and hard drives.

**processor** — The primary computational chip inside the system that controls the interpretation and execution of arithmetic and logic functions. Software written for one processor must usually be revised to run on another processor. *CPU* is a synonym for processor.

**protected mode** — An operating mode that allows operating systems to implement:

- A memory address space of 16 MB to 4 GB
- Multitasking
- Virtual memory, a method for increasing addressable memory by using the hard drive

The Windows 2000 and UNIX 32-bit operating systems run in protected mode. MS-DOS cannot run in protected mode.

**PS/2** — Personal System/2.

**PXE** — Preboot eXecution Environment. A way of booting a system via a LAN (without a hard drive or bootable diskette).

**RAID** — Redundant array of independent disks. A method of providing data redundancy. Some common implementations of RAID include RAID 0, RAID 1, RAID 5, RAID 10, and RAID 50. See also *guarding*, *mirroring*, and *striping*.

**RAM** — Random-access memory. The system's primary temporary storage area for program instructions and data. Any information stored in RAM is lost when you turn off your system.

**RAS** — Remote Access Service. This service allows users running the Windows operating system to remotely access a network from their system using a modem.

**readme file** — A text file, usually shipped with software or hardware, that contains information supplementing or updating the product's documentation.

**read-only file** — A read-only file is one that you are prohibited from editing or deleting.

**ROM** — Read-only memory. Your system contains some programs essential to its operation in ROM code. A ROM chip retains its contents even after you turn off your system. Examples of code in ROM include the program that initiates your system's boot routine and the POST.

**ROMB** — RAID on motherboard.

**rpm** — Revolutions per minute.

**RTC** — Real-time clock.

**SAS** — Serial-attached SCSI.

**SATA** — Serial Advanced Technology Attachment. A standard interface between the system board and storage devices.

**SCSI** — Small computer system interface. An I/O bus interface with faster data transmission rates than standard ports.

**SDRAM** — Synchronous dynamic random-access memory.

**sec** — Second(s).

**SEL** — System event log. Used in the system management software to record system events and errors.

**serial port** — An I/O port used most often to connect a modem to your system. You can usually identify a serial port on your system by its 9-pin connector.

**service tag** — A bar code label on the system used to identify it when you call Dell for technical support.

**simple disk volume** — The volume of free space on a single dynamic, physical disk.

**SMART** — Self-Monitoring Analysis and Reporting Technology. Allows hard drives to report errors and failures to the system BIOS and then display an error message on the screen.

**SMP** — Symmetric multiprocessing. Used to describe a system that has two or more processors connected via a high-bandwidth link and managed by an operating system, where each processor has equal access to I/O devices.

**SNMP** — Simple Network Management Protocol. A standard interface that allows a network manager to remotely monitor and manage workstations.

**spanning** — Spanning, or concatenating, disk volumes combines unallocated space from multiple disks into one logical volume, allowing more efficient use of all the space and all drive letters on a multiple-disk system.

**striping** — Disk striping writes data across three or more disks in an array, but only uses a portion of the space on each disk. The amount of space used by a "stripe" is the same on each disk used. A virtual disk may use several stripes on the same set of disks in an array. See also *guarding*, *mirroring*, and *RAID*.

**SVGA** — Super video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than previous standards.

**system board** — As the main circuit board, the system board usually contains most of your system's integral components, such as the processor, RAM, controllers for peripherals, and various ROM chips.

**system configuration information** — Data stored in memory that tells a system what hardware is installed and how the system should be configured for operation.

**system diskette** — See *bootable diskette*.

**system memory** — See *RAM*.

**System Setup program** — A BIOS-based program that allows you to configure your system's hardware and customize the system's operation by setting features such as password protection. Because the System Setup program is stored in NVRAM, any settings remain in effect until you change them again.

**system.ini file** — A start-up file for the Windows operating system. When you start Windows, it consults the **system.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **system.ini** file records which video, mouse, and keyboard drivers are installed for Windows.

**TCP/IP** — Transmission Control Protocol/Internet Protocol.

**termination** — Some devices (such as the last device at each end of a SCSI cable) must be terminated to prevent reflections and spurious signals in the cable. When such devices are connected in a series, you may need to enable or disable the termination on these devices by changing jumper or switch settings on the devices or by changing settings in the configuration software for the devices.

**UNIX** — Universal Internet Exchange. UNIX, the precursor to Linux, is an operating system written in the C programming language.

**uplink port** — A port on a network hub or switch used to connect to other hubs or switches without requiring a crossover cable.

**UPS** — Uninterruptible power supply. A battery-powered unit that automatically supplies power to your system in the event of an electrical failure.

**USB** — Universal Serial Bus. A USB connector provides a single connection point for multiple USB-compliant devices, such as mice and keyboards. USB devices can be connected and disconnected while the system is running.

**utility** — A program used to manage system resources—memory, disk drives, or printers, for example.

**UTP** — Unshielded twisted pair. A type of wiring used to connect systems in a business or home to a telephone line.

**V** — Volt(s).

**VAC** — Volt(s) alternating current.

**VDC** — Volt(s) direct current.

**VGA** — Video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than previous standards.

**video adapter** — The logical circuitry that provides (in combination with the monitor) your system's video capabilities. A video adapter may be integrated into the system board or may be an expansion card that plugs into an expansion slot.

**video driver** — A program that allows graphics-mode application programs and operating systems to display at a chosen resolution with the desired number of colors. Video drivers may need to match the video adapter installed in the system.

**video memory** — Most VGA and SVGA video adapters include memory chips in addition to your system's RAM. The amount of video memory installed primarily influences the number of colors that a program can display (with the appropriate video drivers and monitor capabilities).

**video resolution** — Video resolution (800 x 600, for example) is expressed as the number of pixels across by the number of pixels up and down. To display a program at a specific graphics resolution, you must install the appropriate video drivers and your monitor must support the resolution.

**W** — Watt(s).

**WH** — Watt-hour(s).

**win.ini file** — A start-up file for the Windows operating system. When you start Windows, it consults the **win.ini** file to determine a variety of options for the Windows operating environment. The **win.ini** file also usually includes sections that contain optional settings for Windows application programs that are installed on the hard drive.

**Windows 2000** — An integrated and complete Microsoft Windows operating system that does not require MS-DOS and that provides advanced operating system performance, improved ease of use, enhanced workgroup functionality, and simplified file management and browsing.

**Windows Powered** — A Windows operating system designed for use on NAS systems. For NAS systems, the Windows Powered operating system is dedicated to file service for network clients.

**Windows Server® 2003** — A set of Microsoft software technologies that enable software integration through the use of XML Web services. XML Web services are small reusable applications written in XML that allow data to be communicated between otherwise unconnected sources.

**XML** — Extensible Markup Language. XML is a way to create common information formats and to share both the format and the data on the World Wide Web, intranets, and elsewhere.

**ZIF** — Zero insertion force.

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